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PSYCHOLOGY APPLIED TO EDUCATION

A SCIENTIFIC APPROACH

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NIROD MUKERJI

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A SCIENTIFIC APPROACH

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APOLOGIA

If it were asked—why another book on educational psychology, it may not be possible to give a forthright answer. However, there is every likelihood for the inquirer to pose the query anew, if he gave a second thought over it, he may then feel tempted to ask himself: why not?

Any one engaged in the teaching of psychology applied to pedagogy must have felt the impact of the new set-up in the educational field in this country. Previously, the teacher could remain contended if he covered the syllabus, to use the hackneyed expression, and for this purpose he leaned heavily on the text books written by authors abroad, many of which were widely acclaimed. But there is now growing a feeling that perhaps all's not well. The reasons are manifold.

In order to meet our present requirements it has become necessary to shift the emphasis of the aims of education. The task of raising the level of subject appreciation is now regarded as of greater consequence than mere acquisition of information. To attain this end with the means old is an irksome job. Psychology, let it be recalled, has long since eschewed the path of sublime intuition, and has taken its rightful place among the biological sciences. Consequently, any psychological approach to pedagogy must be scientific. It is for this reason that the authors abroad presumed that the reader would possess rudimentary knowledge in biological sciences. Unfortunately, however, the large bulk of students in education in this country fails to meet this prerequisite. This is one reason causing unhappiness to the teachers.

Again, it is a matter of common experience that the language employed by the established authors of the foreign countries is not always comprehensible to the common Indian reader. This may be expected. An average Indian student is ignorant of the prevailing conditions which constitute the background of, say, the illustrations used ; consequently, these illuminating illustrations fail to illuminate or to illustrate. The simple and exquisite phrase "we learn to skate in summer" instead of evoking appreciation causes bewilderment in those more intimate with the simmering tropical heat. It is but natural that authors unacquainted with our shores would be unfamiliar with our ways of living. The present author in his humble efforts has attempted to contribute his share in resolving these issues. He will feel his labour well rewarded if he may have achieved partial success. Being conscious of his limitations he would feel much obliged if readers would suggest ways for bringing about further improvement to the initial efforts.

Finally, it is a pleasant duty to recall with warm respect and deep gratitude the enthusiastic encouragement that the writer has constantly received from his past teacher—and a friend always—Dr. Suhrit Chandra Mitra, Professor of Psychology, Calcutta University. Albeit it may sound confessionary, the bare fact is that it was at his instance that the writer had taken Experimental Psychology as the first subject of concern in his life. Despite his heavy duties, Dr. Mitra was extremely generous to revise the manuscript and offer certain valuable suggestions. The author is grateful to Prof. V. D. Thawani, Professor of Mathematics and Statistics, Gauhati University, for going through the chapter on Statistics in Education. To his numerous students the author feels deeply indebted for shewing him the course which has culminated in the writing of this book. In this respect he is particularly indebted to the students in Education of the Gauhati University.

Calcutta,
Buddha Poornimā, 1956.　　　　N. Mukerji

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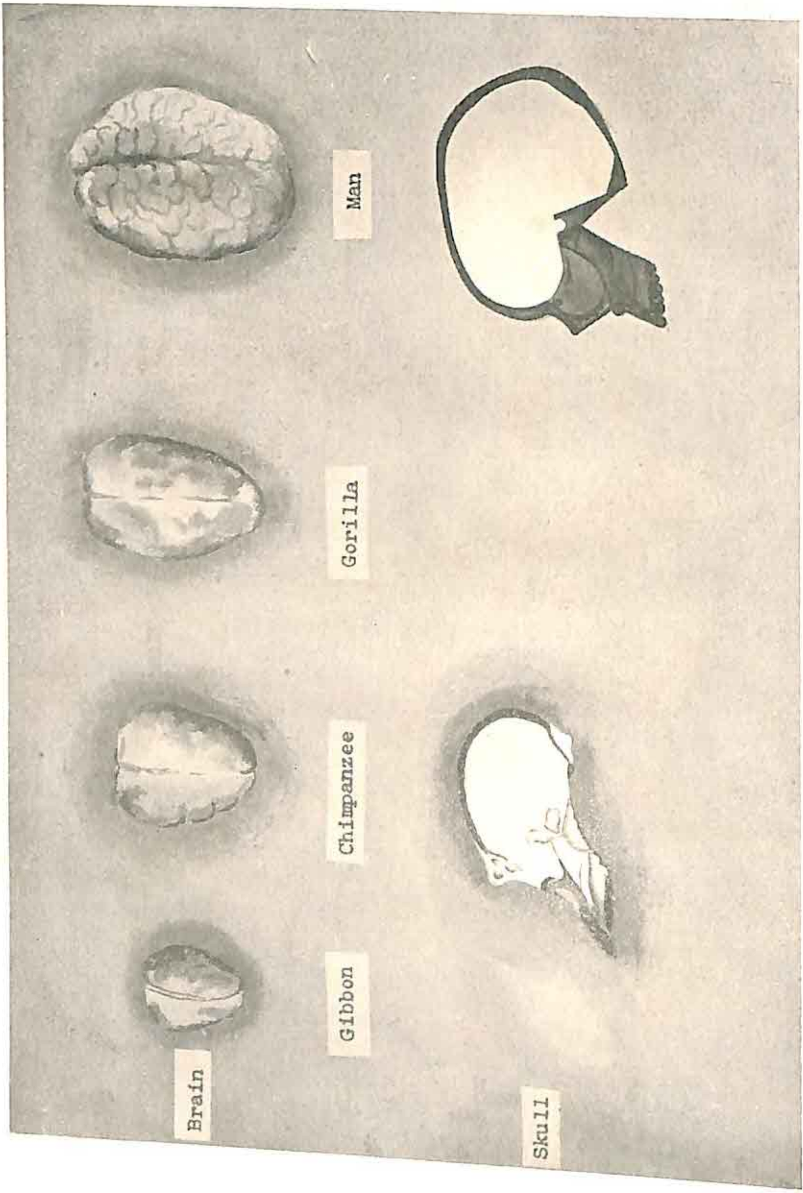
Brain
Gibbon
Chimpanzee
Gorilla
Man
Skull

CHAPTER I

DEFINITION AND AIMS OF EDUCATION

WHAT IS EDUCATION?

When a biologist says that man is animal it is not his intention to lower the esteem of man ; it is *his* way of dividing the living objects into certain broad categories ; viz., flora (plant life) and fauna (animal life). Looking from his point of view man certainly is animal though he holds a unique position in the animal world by dint of his ability to do many things of which other animals are incapable. For instance his speech is coherent and remarkably clear when compared with the animal speech, he can graphically represent his speech, his feelings and thought he can express in poetry and prose and he has established moral and legal codes based on rational principles such as to be found nowhere in the animal world.

Should we then believe, as it is sometimes postulated in the religious books, that man was created as we find him today and no change has been effected through the million of years he has existed? It would be more scientific to rely on our own observations than be biased by *a priori* conjectures. If the different species of animals inhabiting this globe were arranged according to the size of their brain it would become apparent that the difference between one animal and another, including the man, is not abrupt. From the reptiles to the lower quadrupeds like rabbits there appears a continuous link. As we ascend higher in the scale of animals the resemblance becomes more and more conspicuous. Physical likeness between monkeys, orang-outangs, gorillas, chimpanzees and the man is striking indeed. No less striking is the difference. Man can boast of the most notable divergence from the animal in the social and mental spheres, particularly in the latter since the development of human society was possible mainly due to his superior mental capacity.

Biological studies have made it abundantly clear that our earth was not always inhabited by man or Homo sapiens as he is known in biological terminology. The micro-organisms were the first to appear, then the reptiles, followed by the quadrupeds, and man was the latest species to evolve. With the evolution of the animals from lower to higher stages there have grown innumerable complexities in the physical structure of the organisms. Those organs which came to be used less and less during the evolutional stages have grown weakened and those which were used more frequently have emerged strengthened. Man, for instance, makes less use of his teeth compared to the animals and hence his teeth have lost much of the original power of grip just as the jaws have lost their previous strength. With the devise of implements use of arms has fallen and these now have lost strength possessed by, say, the higher apes. On the other hand use of the brain being stressed upon has led to the growth of man's brain which is larger in size and relatively heavier in weight. As a matter of fact man possesses the heaviest brain among all the animals when compared with the total body weight (Fig. 1).

These distinctions which have been accumulating for millions of years have given rise to an erroneous impression that man is altogether different a being from the rest of the animals. However, let us examine some of the distinctive features witnessed in man and see if educative process could have had any bearing on these specific aspects.

Man is known as social animal. In a way all animals are social since, except in rare cases, all animals prefer to live in groups, but man's social characteristics have risen far above the crude herd tendencies observed among the animals. He has developed social and moral codes, manners and customs, which may differ widely from one group to another, but it is this aspect of social development which distinguishes a backward tribe from a progressive nation and man from other animals.

Man is cultured animal. Unlike other animals however men do not live amidst their own kind simply for the sake of self-protection. We have developed certain traits and features not found even among the higher apes which are recognized as man's nearest biological cousins. Justice and piety, pity and charity are expressions which convey certain ideas of which mankind could be justly proud of. If man is the possessor of the most developed brain in the animal kingdom evidently then he has made good use of it.

But then civilization and culture are not static concepts, these are dynamic in nature. It would be the end of a nation's progress if it looked back complacently at its past achievements ceasing to make efforts for further progress. Such a nation would meet its doom. The total human progress after all is the synthesis of the attainments and achievements of the individuals. Some members of the society may have contributed larger share than others, nevertheless it is the individual contribution which has gone to make our society what it is today. Looking from this point of view each individual has some part to play for the upkeep of the continuous progress of the mankind as a whole. Education is the process for equipping each individual member so that he may play his role efficiently. *Education is an art of preparing each individual physically, socially, morally, intellectually and financially so that he may lead an independent life of a citizen and contribute at the same time to the general pool of world progress.* In order to mould the man therefore we should know the man, his physical and mental mechanism and the functions of the constituents. One could not produce an article from a machine unless he possessed rudimentary knowledge regarding the basic structure and functions of that machine, and man is much more complex and sensitive than the most complex and sensitive machine.

A question would arise here: who is to decide upon the nature of education that is to be imparted? In this matter the individual teacher, it should be confessed, has very little say. It is the society that determines the aims of education. It is for those who are at the helm of the state who are ultimately responsible for the planning of the nature of education. Evidently then the aims of education would vary according to the stage of development that the country has already attained.* Once the issue of education were decided upon it should be the aim of the teacher to see how quickly he could attain the ends judging the suitability of the technique used and the ability of the educand. It is here that we would realize the use of psychology.

Looking retrospectively we find that education in the past consisted in the indoctrination of certain ideas and beliefs, the views of the elders were superimposed over the young mind. Consequently the two things which were held important were the teacher and the subject matter for teaching the educand was considered something incidental. The whole system of education, and undeniably there were in existence many principles, suffered from subjective bias and *a priori* hypotheses which were to be accepted under sufferance since these were the views of *pundits and rishis.** Some for example believed that learning of grammar, more precisely cramming the rules of grammar, aided in the comprehension and learning of other subjects. Therefore, compulsory learning of grammar and memorizing of the rules remained for long a standard principle in education. Little interest was shown in determining whether this principle was correct and universally applicable to the pupils of all age groups.

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* Nobody in his senses would think of opening higher schools of technology for the nomadic tribes before they were taught to lead a settled life just as it would be futile to teach the sublime gospel of *ahimsâ* to the cannibals. In this respect the views of the Hindu philosophers that the aims of education would be determined by sthâna (स्थान), kâla (काल) and pâtra (पात्र) remain true.

The educative process of today in comparison gives much more importance to the educand and his ability. While imparting education the teacher has to think not only of the subject matter but also capacity of the pupil. One could say for certain that if there is one issue which distinguishes the educational system of the past from the present it is the emphasis on the pupil. Education is no more believed as forming of habits alone, it is not something in the nature of animal training, the underlying principle is to help in the natural developmental process of the individual in order to stimulate his sense of discernment, ability to discriminate good from bad, vice from virtue, 'ought' from 'ought not'. The person who has attained education is expected to do by himself what he once did under the guidance of someone else. In other words, *spontaneity in discernment* is one of the most important factors in education.

For this spontaneity to grow there must be present in the pupil the requisite interest. We learn better what interests us, remember it longer and make appropriate use of the knowledge than if it were forced upon us. To produce in the pupil induced appreciation of the subject taught is the next responsibility of the teacher. And this would be difficult to achieve unless the teacher were acquainted with the child's nature and knew beforehand what objects and actions interested the child at the different age levels, how the subject matter was to be arranged for teaching and correlated with the different stages of his growth and maturity. No teacher worth his profession would try to teach a class the principles in decimals when the pupils had no knowledge of fractions ; it is for this reason that the teaching of decimals has to be deferred until the pupil reached a certain stage. To take another illustration, if the child had no actual experience of the phenomenon we call condensation it would be futile to expect him to understand the mechanism of rain formation. If unreasonable pressure were brought upon him, memorizing all that the teacher said in this connexion would be the only course left open to the pupil and this as we know would be of little value. On the other hand if the process of condensation were demonstrated to a child of two, he could make nothing out of it, the whole process would appear to him something in the nature of a magical feat. The process of teaching therefore should be properly correlated with the child's ability to grasp what he was taught.

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* According to Chânakya, लालयेत् पञ्चवर्षाणि दश वर्षाणि ताड़येत् ।
प्राप्ते तु षोड़शे वर्षे पुत्रं मित्र वदाचरेत् ॥

In the light of our present day knowledge in psychology how much support the above doctrine could find?

The body of knowledge which has grown by collecting information regarding physical and mental development of the child is known as *child psychology*. The branch of psychology which furnishes us with the requisite knowledge leading to effective teaching is called *educational psychology*. But what is psychology?

Broadly speaking, it is the branch of biological science which deals with the mental phenomena in their diverse forms in man and animal. In other words, intangibility of the subject matter of this science is perhaps the first characteristic. In our everyday life liberal use of the terms like learning and memorizing, perception and imagination lend these an appearance of tangibility like digestion and respiration which phenomena can be observed and directly studied. Though we all know what we mean by the word mind it is rather difficult to define with precision, the main reason being that there is no direct approach to other's mind. One's awareness of the mental phenomena is bound to be limited to his own self and this is not the only limitation. Fleeting nature of the mental states raises fresh obstacles against objective study of the mind. To know about thinking it is not only that I have to rely mainly on my thought processes but, this I cannot do as consistently and freely as I could observe a piece of chalk. Beset with these difficulties we have to seek other avenues for studying the mind.

METHODS OF STUDY

Each individual can experience his own mental states, though for a limited period, if he concentrated upon each. One could then see for himself how in hunger, for instance, the slow moving pain inside the stomach appears at regular intervals, he becomes susceptible to annoyance and irritation, mental lethargy creeps in him, his capacity to think and to reason are adversely affected, and so on. This method of studying one's own mind is called *introspection* which might be translated as looking inwards. This is one of the oldest methods in psychology. Now, though the experience of hunger, pain, lethargy, dejection, etc., are psychological phenomena they are not without their physical counterparts. The latter offer the best media for studying the mind. If one witnesses another person behaving exactly as he himself did in extreme hunger the former then can draw certain logical conclusions regarding the latter's mental states by way of interpreting the behaviour. In our everyday life we are constantly making use of this psychological mechanism; sympathy for instance cannot be evoked unless we tried to interpret mentally the expressions of one's state of agony. Mind then *can* become subject for study *via media* the expressive channels. This method has not only gained in popularity but, also, is found to be one of the most reliable methods so much so that psychology is often described as science of behaviour.

Behaviour however does not mean only those gross expressions which are externally visible. A boy caught in the midst of a misdeed may give himself away by his shaky behaviour and faltering verbal expressions; whereas, a hardened criminal might successfully conceal his mental agitation. Yet a closer scrutiny of the movements of his internal organs—like the altered rhythm of the heart and the changes in his respiration—if were made with the aid of suitable instruments could expose those subtle changes over which one has no control. This kind of study of course is not possible outside the laboratory; this constitutes the *experimental method.*

Now, it is quite possible that a particular child of six years may fail to memorize a stanza of fifteen words even after repeating it several times; could we then conclude that all children would fail likewise? To be sure it would be wise to test a number of children of the same age group and under similar conditions before arriving at any final conclusion. This method of studying groups is known as *statistical method* and plays an important part in view of the fact that no two individuals are exactly alike though they may show a good deal of similarity. The statistical method tells us how much an individual is like the members of his group and how much he differed.

Again, an organism does not behave in an experimental situation exactly in the same manner as it might do in its natural environs. A piece of rock would not change its properties when examined inside a chamber or out in the field. But a child's behaviour would vary extensively at its own home and in the house of an unknown person. To study natural reactions of a child it should be put in the desirable environment. Psychological knowledge obtained of an organism functioning in its natural conditions and environment is called *field psychology*.

It is admitted that much of our present states is related with the past conditions; for instance, a child's inability to learn may be traced to the faulty methods earlier used, or it may be due to the fear ingrained by the teacher in the past. In order to eradicate his shortcomings then it would be necessary to know his past in details to spot out when and how the defect had arisen. For such purpose preparation of *case history* in an objective and unbiased manner is an essential prerequisite.

Summing up, education is a process of moulding the body and mind, direction of the contemplated changes being decided by the society at large. For the purpose of training it is necessary that the teacher possessed rudimentary knowledge of the physical structure (anatomy), and also its functions (physiology). It is through the physical expressions that the mental conditions could be known, and in order to usher the desired mental changes in the pupil the teacher should be acquainted with the broad principles of mental functions (psychology). Psychology can be directly studied by introspective methods, any study of other's mind is bound to be indirect and through the interpretation of behaviour patterns. Knowledge of the child's mental development and maturity (child psychology) is as essential as those which pertain to the educational problems and effective teaching (educational psychology).

CHAPTER II

BASIC SCHOOLS AND FUNDAMENTAL HYPOTHESES

WHY SCHOOLS?

In the studies of scientific subjects the methods adopted are the same. The phenomena under investigation are first observed, then there follows a systematic classification of the facts observed on the bases of which suitable hypotheses are constructed to explain the phenomena. Further observations are then required to check up the hypotheses propounded and, if necessary, alterations are made and a more stable theory emerges. If any other theory however could explain the whole body of phenomena more satisfactorily and with a minimum number of assumptions, the one previously held then is discarded and replaced by the new theory. This is the general principle followed in physics and chemistry, geology and geography, as also in biology and psychology.

There however is a major distinction between the material sciences on the one hand and the biological sciences on the other; the difference lies in the interpretation of the factual evidences. Students of material science can study a phenomenon not only in its natural state but, also, under rigidly controlled laboratory conditions. Inside the laboratory the hypothesis is rigorously checked from every possible angle to see if there were any flaws in it. For the biologists unfortunately this path is beset with certain difficulties. The living being is not so easily controllable as the non-living matter. The living beings are constantly changing within, and are influenced by factors arising outside the body. Under such circumstances it is not easy to isolate the effects from their cause. Animals for example inherit certain features from their parents but these may also be influenced by external factors and thus arises an intricate problem in isolating the variables. The newborn infant does not learn to cry, crying is an innate tendency, but it may arise out of varied conditions, e.g., from thirst, hunger, pain, physical discomfiture, etc. Since all these actions lead to the reactions of crying it is rather difficult to determine exactly what situation was actually responsible for the response of crying. Under such circumstances one has to accept the most plausible explanation, *interpretation* based on the facts available. Interpretations in psychology compared to other biological sciences offer greater risks because of the mind not being directly accessible. Thinking for instance is a characteristic in the man; but, could we be sure that the process of thinking is alike in all children or is same among the aborigines and the civilized people? Experiments in this matter may not be easy to conduct since thinking is a product of human development as much as itself it has contributed towards development.

Due to such limitations in psychology conjecture is bound to play an unavoidable part in building up hypotheses. The theories though must be based on facts directly observed leave nevertheless ground for the growth of a larger number of hypotheses compared to other sciences.

Man's mind offers seemingly innumerable problems for study whereas the number of sound workers is comparatively few. It is not astonishing therefore that all the different aspects of man's life have not received equal attention. Some psychologists started investigations in the domain of perception, others were interested mainly in the problems of thinking, others still were engaged with the problems of feelings and emotion. Based on the theories propounded in their respective domains they attempted to build up bodies of systematic knowledge to cover all the aspects of the human mind. This is the genesis of schools of psychology. Usually it is an individual of outstanding intellect who sets the ball rolling so to say and later may find adherants holding similar views and the school then goes by the name of the originator; or, the school may be known according to the main issues involved. Since Freud was the principal originator of a system of ideas the latter has come to be known by the name of Freud as also according to the inherent principles (of psychoanalysis) involved. Similarly, psychologists contributing to the views of J. B. Watson—whose main tenet is that man's behaviour should be the primary object for study—are known as belonging to the Behaviouristic school. It is not deniable that the numerous schools in existence propounding diverse views on the same subject create at times confusion, but the situation can hardly be avoided. For the present we should give ears to all and decide for ourselves as to which to follow. It is for this reason that we should get acquainted with the different schools of thought.

FACULTY SCHOOL

Interest in the human mind is as old as the civilization itself. The Greek philosophers believed that mind was a composite of several mental *faculties* like reasoning, remembering, perceiving etc. Although they had started with the intention of explaining how we reasoned and remembered, they did not go beyond stating that man can reason and remember, for that is the meaning of faculty. To say that mind is composed of certain mental faculties is no more than saying that we reason and think because we possess these abilities. Later on, this school attempted to prove that all mental activities, presumably taking place in the brain, could be located on the body of the brain itself. Some went so far as to map out the skull into neat lines running like latitudes and longitudes on the globe, demarcating jurisdiction of the various mental activities inside the brain and they called this "science" phrenology. Phrenology though is now dead the phrenologists have managed to survive as we may see from the pages in the *panchâng* or *panjikâ* devoting pages to this intriguing "science".

FUNCTIONAL AND STRUCTURAL SCHOOLS

Study of the human body could be made from two standpoints. It may be asked, for instance, what are the mechanisms inside the body which keep man alive and how did they function, or, one may start with his inquiry about the limbs and organs and find out their interrelationship and the part they played in our existence. Though both these ends would serve the same purpose the inherent outlook in each would vary. The former may be called the functional method and the latter the structural method. Likewise in the mental spheres we may inquire, what are the conditions under which remembering took place, in how many ways intellect manifested itself, how the various mental activities were related together, and so on. Such inquiries would pertain to the *functional school* of psychology. In answering these queries a psychologist would not overrule the possibilities or underrate the necessities of studying the different kinds of mental activities. But his interest would lie more towards solving the problems related to the function than in studying the structure of these mental components. Whereas, psychologists belonging to the *structural school* argue that unless we possessed sufficient knowledge of the 'structure' of the mind we could not do justice to the study of the mental function. They however overlook the fact that mind is not something static like a piece of rock which could be broken into inert components for study; when the rock is broken into power it remains the same rock, the form alone being altered. Mind on the contrary is dynamic; if remembering and thinking, sensation and perception were treated as mental elements these could be studied only in the course of their functioning. The structure and function here could not be isolated like the structure and function of, say, a cart wheel. In studying psychology both of these aspects have to be recognized and considered.

Although both these schools have contributed their share in the development of scientific psychology none of them however could be regarded as *the* psychology. Psychologists of all these schools however realized through their experience that much could be gained by studying physiology, particularly the nervous system.

BEHAVIOURISM

Failure of the functional and structural schools in offering a systematic body of explanations which could solve the basic problems in psychology led to the advent of another school viz., the school of behaviourism. The founder of this school John B. Watson had entered the field of psychology as a roaring iconoclast, captured the attention of the world psychologists and then disappeared like a comet from the field of psychology.

Watson was greatly influenced by the findings of the Russian physiologists Bechtrev and Pavlov, and himself possessing keen originality showed that many of our actions could be explained organically. Fear of snake, for instance, is not something 'mental' and neither it is an innate tendency in the man. It is caused by the ramification of the original fear of loud noise to which the body promptly reacts from its birth; that is to say, fear of snake is an acquired tendency whereas the fear of loud noise is inborn, the fear being transferred from one source to another. This he had actually demonstrated in a series of original experiments. Thus grew his belief that study of the original behaviour patterns in the man, and their development and ramification is the only way which can free psychology from metaphysical influences.

It has to be admitted that behaviourism not only has opened a new vista in the technique of studying psychology but, also, it has given a fresh impetus to study the organic aspects of the human being. Enquiries in these respects however need not necessarily bind us to anatomy and physiology. It means that we should continue to make efforts to determine the functions of the human organs and their correlation with the respective mental phenomena. Watson's protest was against the attitude that some psychologists had shown by treating the psychological phenomena divested from organic responsibilities ; and truly, mind could not have a separate existence beyond the realms of the body.

It may be observed that there exists a certain amount of resemblance between behaviouristic psychology and the views of the structural school. If the latter had pursued in the search of "mental atoms" through introspection, the former was after determining these elements of behaviour with which the individual started his life. The structuralists endeavoured to determine the mental elements which combined to form the mental functions we observe them in our every day life. The behaviourists were after determining how the elementary behaviour patterns developed into those complex streams of behaviour which are attributed to mental direction. The behaviouristic school though has substantially contributed towards the progress of psychology on scientific lines it could not be said to be without shortcomings which lay in its extreme radicalism. For example, behaviourists deny the existence of mind and would like us to discard altogether the expression mind. Now, we all agree that the organic responses play a conspicuous role, say, in evoking fear, but we could not thereby deny that fear in itself is a psychological entity, it has a definite place among the mental phenomena and to deny this would be to deny factual evidence.

GESTALT PSYCHOLOGY

If traces of structural psychology could be noticed in the behaviourist's standpoint, traces of functionalism may be observed in the gestalt theory. The name of this school is closely associated with three German scholars, Wertheimer, Köhler and Koffka. They started with the intention to determine the conditions under which perception of movement took place. It is commonly held that perception of movement is caused by the movements of the eyes, or that it is an ability in itself which is unanalysable. But these conjectures have now been set to rest. Here is a simple experiment. If two straight lines were drawn an inch apart and parallel to each other, and if each line were exhibited immediately after the other, we would see then not two separate straight lines but one line moving sideways. This would happen even if the eyes remained fixed. If speed of shewing were somewhat lowered the straight lines could be seen once more as appearing and disappearing alternately. On the other hand, if the rate of exposure were increased the lines would then be seen standing motionless as one long straight line. In other words, perception of movement depended upon the way how the objects were exposed to the eyes just as we see the still negatives as moving when projected on the screen successively and rapidly. Based on such experiments on men, animals and children the gestalt psychologists have tried to develop the basic theory that it is the existence of certain fundamental organizational patterns in the things we see, hear and feel which determine our seeing, hearing and feeling. Within the total organization its components lose their identity. When we hear a tune the different notes lose their separate identity and we hear *a* tune instead of a succession of notes. The chair, likewise we see as a whole and not as a combination of four legs, a seat and the back. It is only later that we try to distinguish one sub-whole (the legs or the back for instance) from the whole which is the chair. It is in a way diametrically opposite a view to that of structural school. In brief the mind's total functioning in its different modes is the main subject matter of study for the gestalt psychologists.

HORMIC SCHOOL

The main thesis of this school led by William McDougall —a great name in psychology—is that man's thoughts and actions are guided by motivation ; our actions are never devoid of purpose. Man is born with certain tendencies to act, there are certain inherent urges to be fulfilled and these McDougall called instincts. He prepared a list of such instinctive urges and actions which determine our behaviour. But these instinctive urges have remained hypothetical, never any attempt has been made to analyse or classify them scientifically and less to verify McDougall's views experimentally. Besides, not all urges that McDougall has stated are found to be inborn. Laughter for instance has been marked as a specific instinctive urge, and all men, irrespective of their cultural status, should be born capable of laughing. And yet there are certain primitive people who are devoid of this characteristic, neither did we witness laughter among those children who from their infancy were reared by animals. Nevertheless there appears a good deal of truth in the statement that "The striving to achieve an end is . . . the mark of behaviour, and behaviour is characteristic of living things."[1]

Another school of thought which has gained considerable importance in the psychological world is known as *psycho-analytical school.* We shall have occasions to discuss it in details while examining the problems related to the unconscious mind.

OUR STANDPOINT

From what we have discussed uptil now it may be concluded that there is no psychology in our immediate view which can replace the psychologies. None of these by itself could deliver the goods and yet each has undoubtedly contributed its share towards the general progress of our knowledge.

What standpoint then we may adopt for our future course? In such a dilemma one might feel tempted to take the ecclectic view, that is to accept the best from each school. But then ecclective doctrine is no doctrine at all, it is one way of avoiding the dilemma. The aim of psychology is to arrive at the truth regarding our mental life and explain the phenomena on rational bases but there should be a continuous link between the explanations offered for the divergent phenomena.

Now, explaining each of the mental functions if we were to depend on the different schools for its explanation—when the schools themselves are at warring path—all progress in psychology would immediately cease. Each school may explain adequately one mental phenomenon or a limited few but none suffice to answer all the problems with which we are faced. In reality we find that none of the schools offer us any *set of basic principles* which we could accept *in toto,* we could not adhere to any school from A to Z.

And yet all the schools endeavour to answer the fundamental query: how man acts in relation to his environment? Whether psychologists "speak of behaviour or of conscious experience or of activity in general, they all have before them *the individual in relation to the environment.*"[2] And this is what we should strive to attain. Perhaps some day there would be *a* psychology to replace the existing host of psychological schools. But the day as yet is far off. Knowledge of the endocrine system we have little and of the nervous mechanism still less, whereas these organs have a good deal to speak for our mental states and physical actions. So the doorways to the mind are left only ajar. Nevertheless, during the fifty years much has been done to lift the science of psychology from the old ruts of arm-chair speculation. This has been possible only because of the increasing number of investigations being conducted in every sphere of mental life. Observation—classification—formulation of hypothesis—further observation . . . . this should be our way of approach to the subject. Any hypothesis which is objectively tenable we would readily accept. The "middle of the road policy" advised by Prof. Woodworth is perhaps the safest to adopt in psychology.[3] This sound advice is of particular value because it is our intention to improve the methods in education. It is not the development of science alone which is our concern but, also, application of the results for the benefit of the educands left to our trust. We cannot afford to adhere dogmatically to the tenets of a particular school no matter how spectacular be the name attached to it; it would be wiser to observe facts and infer on the basis of our own judgment.

SOME FUNDAMENTAL HYPOTHESES IN PSYCHOLOGY

Philosophers for centuries have taken keen delight in lengthy discourses to prove, or to disprove, the existence of the mind. We do not intend to take part in the wordy duels. Instead we would start with the simple premise that man possesses mind. By virtue of its being intangible, manifestations of the mind are not directly observable, nevertheless the ways open to us we have found quite satisfactory. Our assumption regarding the existence of the mind—and this is the first hypothesis—could by no means be said to be dogmatic.

As we have noticed on a previous occasion, to seek for any proof of the existence of the mind we should start with the observation of behaviour. By behaviour we mean any physical or mental activity, visible with or without technical aids, caused in the organism under a specific situation. In anger for instance we can observe the external changes in the facial contour and colour, effects on breathing, affected gait, etc. These are the physical manifestations along with which there are discerned mental shifts. In anger one feels incapable of concentrating his attention on any subject besides the one which had evoked anger, ability to reason and judge in an unbiased manner is affected, and so on. In other words, the *situation* of anger is *responded* by changes in the physical and/or mental behaviour. In other cases the responses might not be so clearly visible and may remain invisible without the aid of finer instruments. If, however, one were asked to describe all the facial changes occurring in anger it could almost be impossible to draw an exact portraiture. Nevertheless, even a child can distinguish between joy and anger as reflected on the faces of two persons. How does he do it? We should bear in mind that *each expression has its specific pattern* which helps us to guess. By way of our second hypothesis we could maintain that the *mental states find their reflexion in the behaviour patterns.*

The table below shows how the diverse types of behaviour are aroused under varying situations:

Situation	*Behaviour*
(1) Sun rays striking the eyes (Physical) ...	—Constriction of the pupils (Phy.) —Pain and discomfiture (Psychological)
(2) Recalling the death of one who was loved (Psy.) ...	—Sorrow (Psy.) —Expressions of sorrow (Phy.)
(3) Rebuke (Phy. + Psy.) ...	—Changes in the facial expressions (Phy.) —Anger or distress (Psy.)

In the first illustration in the above the situation is of purely physical nature. The light rays and the eyes concerned are both tangible objects. But the resultant behaviour caused is physical as well as psychological in nature. In the second illustration the act of recalling is something purely mental in nature but, again, the responses are physical *cum* mental. In the third illustration the situation is slightly complicated, the sound produced in the rebuke is no doubt physical but it is interpreted as an expression of dislike and this interpreted situation is certainly psychological; so, we may call the situation psychophysical. However, the behaviour, once more, is a combination of physical and psychological reactions.

What conclusions may be drawn from the above analysis? The mind and body both may be affected by the impact of the external world, and they may equally respond to the situations possessing physical and psychological characteristics. More simply, the body reacts upon the mind and *vice versa*, or, the body and the mind are interactable. This theory depicting the relationship between body and mind is known as *interactionism*. This is the third hypothesis.

A newborn baby is not taught to suck and yet it starts sucking from the first day; nobody teaches it to sleep and yet it falls asleep when it wanted to; it cries of its own self, and grips any object that may find contact with its open palm. In none of these instances the child received any training and yet acts in an efficient manner. The child is born with certain inborn characteristics, or, as we may say, innate *traits* or *dispositions*.* But these traits may also be influenced by training. The natural act of devouring like animals, as is witnessed in the young children, would be repeated unless it were trained to take its food in a more mannerly way. The natural grip can later be trained to hold the hoe or the pen, to shoot a bow or fly a plane. The same could be said of the mental states. The child from the earliest stage expresses fear against sudden loud noise or a jolt. This emotion of fear finds its expression in its cry. But it does not react similarly to the dark rooms. If, however, it were taken inside a dark room and some one shouted *"bhoot"* the child would *develop* fear for the dark room as also for the word. The conclusion is that the child is born with certain native propensities and these can be influenced by training and guidance. This is the fourth hypothesis.

The hypotheses that we have made in the above are not conjectures or mere assumptions. These are based on facts as may be seen by any one and verify them. And, acceptance of these hypotheses does not bind us to any particular school of psychology or philosophy, though these may help us immensely in understanding how modifications could be made through educative processes.

HEREDITY AND ENVIRONMENT

Earlier in this chapter it was observed that man, for that sake any living being, is born with certain innate traits. There arise in this connexion two issues which require clarification. Firstly, it may be asked, if these inborn capacities are rigidly fixed, that is to say, if they are resistant against any attempt to modify them. If so, education would have to face a tremendous obstacle. By education it is intended to modify the raw man to meet the social requirements. If it were possible to modify these traits under the impact of the environment it would be worth-while to know beforehand how much could be expected in bringing about the desirable changes.

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* *Trait* means any psychological or biological characteristic which an individual may exhibit after his birth, or learn later on. Abilities to cry and sleep may thus be called innate traits, and learning an acquired trait. *Disposition* means any organized tendency which may be expressed in a behaviour. The child from its birth is disposed to act in certain specific manners and does not wait for their appearance through training.

Secondly, in view of the fact that an organism grows out of the parent organisms, do the latter play any important part in the causation of the physical and mental states in the former? To what extent the propensities in the child could be attributed to the parents?

To start with, two expressions which are in common usage need be clearly distinguished. It is commonly observed that the offsprings of tall parents are usually tall; the offsprings of Chinese parentage tend to be taller than those born of Afghan parentage. Barring a few exceptions parents with dark complexion may well expect their children to bear similar feature. In other words, we are born with certain physical characteristics over which we have apparently no control. Such expressions as 'constitutionally weak', 'hardy stock' go to indicate that some persons by birth could be expected to offer evidence of their individual characteristics not possessed by others. Colour of the hair and eyes, complexion and stature are some of the illustrations belonging to the category of physical inheritance, and such factors are called *inherited* traits. In a family where may exist a case of colour-blindness* there would be every possibility of coming across some other members related to this person by blood who also are colour-blind. Such features an individual inherits from his parents and forefathers and he in his turn would pass it over to his progeny. The mental traits too may be likewise passed from one generation to the next. Intelligence is a salient example of psychologically inherited trait, so is the ability to memorize and the capacity for retention; certain forms of insanity too are inheritable.

In contradistinction, those traits are called *acquired* which the individual comes to possess in his life time. Accumulating fat by overeating rich food, or growing muscular toughness by prolonged physical exercise are examples of acquired characteristics. Learning is acquirement and it may be in the physical or mental sphere. In order to hold the pen or the plough one has to pass through a course of training and acquire the respective capacity; so could be said of learning the multiplication table or a language.

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* Inability to distinguish a particular colour is known as colour-blindness. Some people may be habitual prey to the error in the naming of a colour, they may call green as blue and then hasten to rectify their error. But a colour-blind would never see blue as we know it through our experience, he would see it as a particular shade of grey and learn to call it blue. Another may be unable to see green or red, and he would be called green or red blind.

To sum up, we are born with certain native capacities, and by observing educative principles we learn how to modify them for our own benefit. If it were known which of the traits are inherited and which acquired, the job of the student in education would become much lighter. A teacher then would have an idea in which respects and to what extent he could expect to succeed in bringing about the necessary modifications in the educand, and also, to make the best use of those traits which are unalterable. Intelligence, for instance, is a mental characteristic which is little changed, if at all, by changing the environmental conditions; consequently the teacher's function in this respect would be to make the most suitable use of the quantity of intelligence that the pupil possessed. Likewise, he may refrain from making any attempt to "increase the memory" of the child, instead he may take help of the different methods to aid the child in memorizing. On the other hand we are aware that knowledge in a subject once gained can be retained better if sufficient practice were allowed. Here lies the function of drilling in arithmetic. By practice we strengthen a trait which the induvidual has acquired in his life time. A clear conception of the innate and the acquired traits and abilities would enable the teacher to be aware of his own limits and the limitations in his pupil.

An important problem that arises here is, how to evaluate the comparative influence and effect of heredity *vis a vis* environment. A complete study of the inherited traits as against those which were acquired could be possible only if one of these were kept constant and the other allowed to vary. Among the persons of same age and intellectual calibre but reared under completely different environmental conditions if one developed keener sense of discernment and finer tastes in life, and if their intrinsic intellectual ability remained the same, one would have to accept the fact that the first two mental qualities were influenced by environmental factors afforded in training but not the third. A note of warning here is warranted. What is commonly observed as the 'same environment' is hardly the same when judged from scientific point of view. It is often wondered why the children reared in the same atmosphere and brought up under similar conditions learn to behave in radically different manner. The father may say that he loved all his children equally and he may lead himself to believe that he treated them alike, but looked from the cold eyes of science the errors in his belief could be revealed. A child who was brighter than the rest obviously would draw greater attention from all and would soon find itself as the pet of the family; the arrogant, unruly child is bound to meet unenviable treatment, and they would grow differently even under the 'same condition'. Such situations present a formidable difficulty in distinguishing which of the mental factors were inherited and which were enriched or impoverished by educational training. It is due to this reason that most of the past attempts to study the relative effects of heredity and environment have ended in futility. Here are some notable illustrations.

Francis Galton, a renowned British scientist, on closely examining the biographies of 977 eminent persons of science and letters found that they begot many more persons of repute than could be found in a similar number of ordinary families. *More interesting was the investigation made by Dugdale. Jukes, a fictitious name given by Dugdale to a certain person,* had married his two sons in a rather degenerate family. Scrutinizing the history of the descendants of the two families Dugdale found that there was an extraordinary abundance of criminals, paupers, men of low intellect and lower morals, and women of ill fame. This state of affairs he believed could not be accounted for unless it was accepted that like begets like. Likewise, Goddard made a study of the progeny of an unfortunate person whom he gave the name of Kallikak. The descendants of this person through a feeble-minded girl, numbering 480, were mostly criminals, feeble-minded and alcoholics, and never they were assets to the society. Kallikak, later, had married, once again, with a woman of good stock. The progeny from this stock, numbering 496, were traced and it was revealed that most of them were normal and some bore supernormal mentality.

From such studies it would be reasonable to deduce, superficially though, that heredity is the key factor in making a man what he is. But there exist side by side some other investigations of contrary nature. De Candolle, a French scientist, had analysed the biographies of 552 reputed scientists, authors, etc., of French, British and German origin. His aim was to determine the environmental conditions of these personages which had aided in the blossoming of their genius. He concluded that such factors like freedom from poverty, high

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level of cultural atmosphere in the family, facilities for education, etc., were responsible for taking them to the path of fame, and all these factors pertain to the domain of environment. Percy Nunn has drawn our attention to the case of the inmates of the Bernardo Home which is a well known orphanage and a great institution of its kind in Britain. The records of the inmates of the Home go to prove "the most unpromising stock, when properly nurtured, may yield good and sound human material."[3]

Both these schools of thought however have suffered from an error of judgment. Success in all these investigations has been judged in terms of mental ability. While the first school maintained that such mental abilities were bound to appear if one had inherited them, the other school—better known as neo-Herbartian—believe that environment was responsible for producing the mental abilities as they were. But both might be true, partially. Could intellect manifest itself with certainty *even in the absence of opportunities?* Heredity by itself could *be considered as the sole criterion of genius if it were finally proved that the slums in which lived the descendants of Jukes* amidst poverty, filth and degradation, had no baneful effect against producing men like Darwin and Galton. On the other extreme, if environs alone were sufficient to raise the feeble-minded children to the level of normalcy it could be believed to be the main cause in making the man what he was. But this would be a futile expectation.

The important outcome of these studies is the realization of the extreme difficulty in using man as an experimental guinea-pig in deciding the issue of heredity *vs.* environment. To keep either of these factors constantly under control in order to see how the other changed under varying conditions it is virtually impossible in the case of man. It is for this reason that experimental human genetics has made little headway. We have, therefore, to fall back upon the studies made on the animals in whom the environment could be rigorously controlled. In the following we would examine the results of some of the investigations conducted in this direction.

Tryon has made a thorough investigation on the inheritance of the learning ability in rats, and this ability is based on the intelligence of the organism which is an inherited factor. An unselected sample of 142 rats was used to determine which of them quickly learned to get out of the maze especially constructed for this purpose. Each of these rats was offered 19 trials and records were kept of the number of successful

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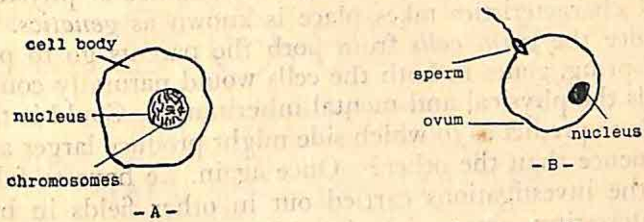
attempts. Those which took less time in learning and thus proved to be bright were segregated from those which were evidently dull. The bright ones were intermated and the dull ones were allowed to breed within their own group. The offsprings of the next generation in both these groups were given equal opportunity to learn how to get out of the maze with the intention of selecting them further. Thus the two groups, one consisting of the bright and the other of the dull ones, were arranged to grow in segregated manner. The experiment continued till the 19th genereation was reached. By this time the results in success in the two groups became distinctly sharp and extensive, so much so that an observer who was not aware of the actual fact that the two groups had come from the same stock would have believed that they were of completely different origin. The average rat in the bright group was about five times superior to the average rat in the dull group when superiority was judged by the number of successful attempts in negotiating the maze. It is needless to add that all the rats had received equal treatment in every respect in the hands of the experimenter.

Since no additional advantage was made available to the bright animals in their performance in this experiment it is to be concluded that the capacity to learn is an inherited trait. Trained under the same environment an organism would learn only to that extent to which his native traits permitted although each individual varied in its improvement. Even the dullest took less and less time in negotiating the maze as the experiment was repeated. Apparently each had profited from its experience but the extent of benefit derived was not same in all cases, a dull animal was benefited much less from the same experience than a bright one. In other words, improvement in learning is possible provided the environment is favourable, as it happens in practice, but the extent of improvement is determined by the hereditary factors. For the present this theory would suffice in explaining a fundamental principle in educational psychology. Later on we would see how these combined to produce the individual differences.

MECHANISM OF HEREDITY

Now that we know for certain that the mental charactertistics of certain types are inherited one may be inclined to ask if there is any definite mechanism operating in inheritance; what are the conditions which make inheritance possible, how far the body is responsible for our hereditary qualities, and how do they occur? These and kindred issues would necessitate attacking the main problem of heredity from two different angles, viz., its qualitative and quantitative aspects. In the former would be included the biological issue of inheritance, that is, how the organism inherited the traits. Next we shall try to see if heredity is predictable, and this would entail examining the quantitative aspect.



Head of the sperm enters the cell body of the ovum. After they are fused together the ovum will become fertilized.

A typical cell.

FIGURE 2.

In producing the offspring both the parents contribute their share. The egg-cell or the *ovum* as it is called represents the mother's share. But this cell* is incapable of producing unless it meets the *sperm cell* from the father. The two cells are then fused together and the resulting cell is referred to as being *fertilized* and it is now capable of producing the offspring.†

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* A *cell* is the smallest unit in the organism, equally in the plants, animals and the man. The cell, however, is too small to be seen with the naked eye, and yet, life starts with a couple of cells only! Each organ in the living being can ultimately be analysed into cells though these may differ in size and shape from one organ to another. Those of the particular variety responsible for propagation are called *germ-cells*.

† In the human being each month at least two egg-cells are produced by the female. If none of the cells is fertilized in the proper course of time they go out of the system during the menstrual period. If, however, a cell is fertilized any further production of egg-cells in the successive months is withheld till the birth of the baby. If by chance two cells are separately fertilized by two different sperm-cells the result is *fraternal twins*. Sometimes it happens that the fertilized ovum is split into two equal halves, then two babies are born out of the same ovum and they are called *identical twins*. For psychobiological purpose fraternal twins can be treated as *siblings* (brothers and sisters born at different times) conceived together since more than one fertilized cell was responsible for their birth.

Now, each *cell* (Fig. 2) consists of a *cell body* and a *nucleus* imbedded in it. The nucleus under a powerful miscroscope would be seen consisting of rod-like substances called *chromosomes*. Each chromosome is believed to contain "packets of chemical substance" called the *genes* which are suspected to bear all the hereditary characters. Investigations regarding the accurate nature and functions of the genes now occupy a prominent part in biology and the branch of science especially devoted to seeking exactly how the inheritance of physical and mental characteristics takes place is known as *genetics*.

Since the *germ cells* from both the parents go to produce the offspring, genes in both the cells would naturally contribute towards the physical and mental inheritance. Could it then be possible to predict as to which side might produce larger amount of influence than the other? Once again, we have to fall back upon the investigations carried out in other fields in biology. An interesting observation in this respect was made by a Checkoslovakian abbot, Gregor Mendel by name, in the latter part of the nineteenth century.

His observations though confined to the common garden peas nevertheless laid the foundation for future investigations in this subject. Mendel had noticed that if the peas which were round and smooth when dry (to be denoted henceforth by the symbol RR) were crossed with the variety of peas showing wrinkled surface (WW) they produced the RR type. Since two different kinds of characters were mated, the product is called hybrid in biology, hybrid of the first filial generation (to be referred as f-1). But when these peas were self-fertilized, that is to say crossed among themselves, some of the peas in the next generation (f-2) revealed the WW character. Now, it may be questioned how this character is manifested in the f-2 generation when it was not present in any of the peas in the previous generation. Evidently this feature somehow lay concealed in the peas of the f-1 generation. This characteristic of wrinkledness which was absent in the f-1 generation may be called the *recessive character* in heredity ; and the other one the *dominant character*. Dominant is that trait which appears in the hybrid of the first generation.

There was yet another interesting feature noticed by Mendel. The wrinkled pea of the f-2 generation never failed to show its own kind in subsequent generations. The wrinkled character was now fixed so to say. It had reached the stage of purity as it is known in biology. Out of the rest in the f-2 generation, some invariably produced round surface in future, and the characteristic of roundness in these could now be called a *pure character*. Barring these, the rest retained the peculiarity of wrinkledness within their round surface to be revealed again in the next generation (Fig. 3a).

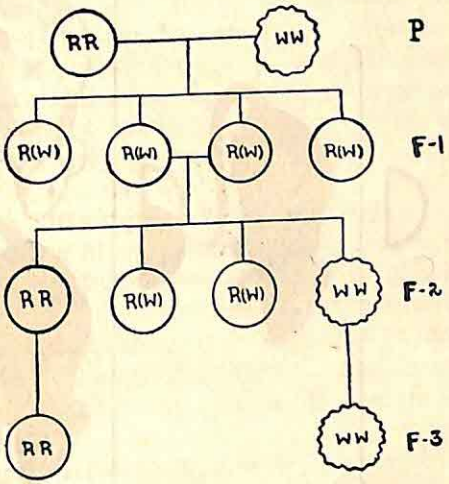

FIGURE 3a.

INHERITANCE OF THE DOMINANT AND RECESSIVE ELEMENTS.

Diagrammatic representation of the results when round surfaced peas (RR) and wrinkled surfaced peas (WW) were crossed. P—Parental peas; F—1, F—2, and F—3 are the first, second and third filial generations.

Taking the cue from Mendel's observations biologists have set about to see if such peculiarities in inheritance may be observed in the animal world too. That it is applicable to a very great extent cannot be denied (Fig. 3b).

These observations may now be generalized in the following manner. If two different characteristics were contributed by the parents the dominant one may be manifested in the child with the possibility of the recessive characteristics appearing not before the f-2 generation or much later than that. Thus is explained why fair complexioned parents may give birth to dark children and *vice versa*, and dwarf children are begotten of tall parents. The dark complexioned, or the dwarf child carries within it the potentialities of the opposite types of character to be manifested in later generations. Mendelism thus offers a plausible explanation as to why sometimes we come across a Shakespeare or a Kâḷidâs amidst seemingly mediocrity.

To find the reasons of low intellect in a child it is not enough to inquire about the intellectual level of the parents; the seeds may have been sown generations earlier.

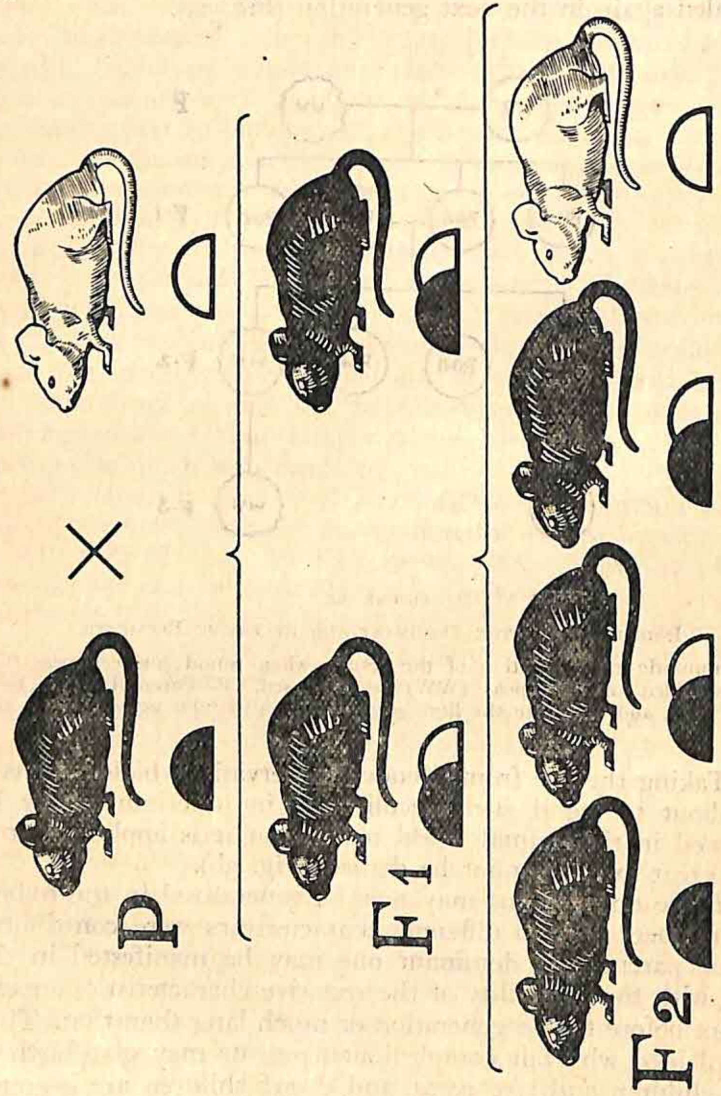

FIGURE 3b.

Results of crossing white and grey mice. Colour being dominant element appears in the hybrids of the first generation. That the white colour remained recessive in this generation is proved by its appearance in the second filial generation.

(Adapted from L. Cuenot: L'Adaptation)

Efforts are being made by genetists to isolate the units of characters which are transmitted from one generation to another and which mix together to produce the innumerable varieties. But the greatest obstacle felt, as mentioned before, is that man as he grows combines in him the hereditary and the acquired charactertistics. Ability for musical performance, for instance, is an acquired characteristic. That is why children reared in musical atmosphere pick up music much better than others, and even adults can be trained to appreciate music and play on complicated instruments at a much advanced age. What, however, is known as talent for music is something which is inherited and not dependent on the acquired factor alone. Beethoven and Mozart had shown their acumen even before any serious training actually had started. People may be taught to invent and paint but a Leonardo is born and not made.

Statistics employed in the field of genetics in the plants and animals gives an indication that in future it may not be impossible to predict the possibilities of a particular characteristic appearing in the offspring when its presence among the parents were known.

Under such circumstances what should be the practical line of action for the teacher to follow? He had before him only one course to pursue, viz., to offer the best possible environmental facilities to his pupil for him to develop fully whatever innate capacities he was born with. Nothing would be more dangerous for a teacher than to be dogmatic about hypotheses. Let him be guided by the psychological findings by all means, but this he should do with his sense of judgment kept alert, and he should always be prepared to learn from his own experience. He should however remember that the natural gifts by themselves are not sufficient for success to ensue. Genius, as someone has said, albeit tritely, is ten per cent inspiration and ninety per cent perspiration. The great potentialities in Mozart and Beethoven, Shakespeare and Newton, Tagore and Râman would have gone in vain without ceaseless, well directed and concentrated efforts. It would be basking in vain romance to believe—and how dangerously common is the misconception—that great deeds are the outcome of 'born intellect' for which one has nothing to do but wait (or, wait for "the luck!"). Not all inventors and authors, scientists and artists, show signs of born gifts, and yet their contributions have always progressed the civilization a step forward. Man's actions represent his success in modifying his innate tendencies and making the best out of what he possessed. If the inborn traits be too strong they would resist all efforts for modification, but in most cases they show pliability to a considerable extent, and it is here that the educationist has his opportunities.

MENTAL UNITS

For purposes of objective study the body has been divided into certain categories. The parts which function and bear similar purpose are considered as functional units. Thus have grown the nervous system, the vascular system, etc., and the nervous system is again subdivided into the brain, the nerves and the sense organs. But in studying the mind we are faced with one of the greatest obstacles in the shape of its intangibility. What criterion for division could be adopted in the case of the mind?

Here we have to depend primarily on our own consciousness, or awareness. The external world for me exists because I can feel it, see it and react to it, as the philosopher Descartes had said: "I experience therefore I exist." If the mind is to be divided into plausible units the process must be based on this criterion of consciousness. One would have to question himself, in how many different ways does he realize this world? If one's reactions were analysed what would be the remnant units that we would find? And, for this purpose one would mostly have to be guided by his introspective data.

Following the above methodology the mind has been divided into three functioning categories, viz., *cognition* (experience of knowing), *affection* (experience of feeling), and *conation* (striving). All our mental phenomena ultimately may be traced to the combinations of these *mental units* in their various shades. In doing a sum the pupil cognizes the task before him ; he may strive to complete the task or he may not ; and, in doing so, he may experience the affection—pleasing or otherwise. Here we see that an overtly single and simple act may possess within its folds all the different mental units in their functioning. Development of each of these functions follows its own pattern. While the growth of cognition in an individual may roughly be represented by a straight line the same could not be held of the development of affection. It may ramify in a zig-zag pattern into a number of sentiments and new types of feelings may evolve and yet lessen in intensity with the age. An adult possesses those varied sentiments which the child is incapable of experiencing, but the child experiences its emotions with greater vigour and intensity.

Another thing to be noticed is that individuals vary extensively in the rate and level of development in these mental units. The will to act and to think may vary from person to person like the abilities to cognize and to feel. Illustrations could be added infinitely to show that these mental elements formulated long ago show no reason for discarding them today.

But it would be wrong to suppose that these experiences existed, or could exist, in isolation. In studying the body we may pay more attention now on the muscles and then on the bones. But it is unthinkable that either could exist without its food, the blood, which is supplied by the vascular system. The lungs could be studied as a set of separate organs but to think them existing isolated from other systems and yet surviving is not possible. These are different organs each possessing its own characteristic though at times diametrically opposite to its immediate neighbour, yet all pursue the same end, viz., existence of the body as a whole. The mind functions likewise. In some ways feeling may be exhibited as diametrically opposed to thinking, emotion retards thought processes, but it is feeling which drives us to think and act. Faced with a sudden perilous situation (and here the cognitive part of the mind comes into play) the emotion drives us to think and act more quickly than we would have done otherwise. Afraid of punishment, for the pleasure of being rewarded, or for the sheer emotional satisfaction that one gains through knowledge, the pupil may work harder and more efficiently. So, these mental units function in their unity and produce the unity in our conscious experience. It is thus that unity in diversity in the mental world is maintained.

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CHAPTER III

PHYSICAL BASES OF MENTAL LIFE

The potter before he takes to manufacturing articles out of clay makes sure of its quality. He knows that sandy clay would not suit his purpose nor if there were too many pebbles in the raw material. So would the carpenter examine the wood and the smith his metal. Since education consists in the moulding of human being, teachers and parents should be acquainted with the nature of the material that they were expected to handle. While learning to read and write changes take place in the learner not only in the sphere of mind but also in his body. This is one reason why knowledge of the physical development of the child is an essential prerequisite to the teacher. If the text books written for the infants are not printed in the same type as books meant for the adult it is because the optic organs in the former are not matured enough to see quickly small objects and tiny letters, and much harm may ultimately be caused to the eyes by forcing the child to read small types. As it will be seen later, training in writing is correlated with the different stages of physical maturity, and before any development in any particular sphere could be properly understood the nature and functions of the organs must be thoroughly grasped. This however is not the only reason for the need of the teacher's acquaintance with the physical organs and their functions.

Mind does not exist isolated from the body though it may not be possible to locate any particular part of the organism which could be said to produce the mind as liver secretes bile. Nevertheless, certain organs are more intimately related to the mental functions than the rest. A person who may have lost his limbs would continue to see and feel, reason and think as any other person ; he would miss only those types of mental phenomena like tactual perception which grow out of manipulation of the fingers and the palm. These organs have something to contribute towards the perception of touch. On the other hand, a person blind from birth would never be able to realize the variety of colours and sights experienced by others, and his general experience would suffer proportionately. He would however miss more than the person without limbs. The function of the eyes could then be said to be of greater consequence for acquiring our knowledge regarding the external world. If the brain were diseased the disabled person may not only forfeit his perceptual abilities but, also, may lose the capacities to learn and to judge, which are considered as the highest among the mental functions. In other words, mental impressions are correlated with the impressions made on the organs of the body just as the physical expressions are correlated with the expressions that the mind desired to make. To interpret the mental state correctly it is, therefore, necessary to know something about the manifold ways in which the physical organs function.

Since the body and mind are intricately and intimately related together nature of the relation between the two should also be known. How much and in what ways the different physical components helped in producing the various mental experiences? To enable one to answer such queries the knowledge of the structure and the functions of the body becomes incumbent.

The body is composed of various organs, and each organ has its set of functions to perform. The component organs in the body are not as independent as they may appear superficially. Each part, or even each sense organ, has its specific ends to serve and to this extent it can be counted as a unit by itself. If the eye be considered a unit so is the brain as also are the nerves connecting both of these. For the eyes to see, however, the brain must be functioning and the connecting links of the nerves too must be in order. The skin provides us with the sensation of touch but an arm severed from the body would cease to function in this respect. Evidently then, the touch sensation though is a characteristic function of the skin could not be produced unless some other units of the body co-operated with it.

It may be then concluded that the body functioned through the various units each of which has a specific function, but these units functioned only when they were integrated with other units and formed larger units. Closer observation would reveal that this process of integration continues to form larger and larger units till we find the body functioning as a whole. A pupil endeavouring to do an arithmetical sum in front of a tyrant teacher may see the figures and words in print, but the fear in him would retard his thought process, the brain might not function in its normal manner, it might fail to supply the impetus which could be translated by the hands in writing and the tongue in speaking. Though the organic units for writing and speech remained intact their normal functioning is put into discord owing to the disturbances in the emotional unit. The whole situation might alter radically if the teacher removed himself, and then all the different units might start functioning normally.

THE FUNCTIONING UNITS

As students of education our interest in the body lies not so much in the structural aspects as in their modes of operation in connexion with the mental life. From the functional point of view mechanism of the body may be differentiated into three fundamental systems, and these we shall examine below.

(*a*) *The Sensory Mechanism*

In this category would be included all those organs which are essential in producing a faithful picture of the external world. The process of our awareness about the world around us starts at the sense organs though it does not end there. The sensory mechanism mainly consists of the sense organs which Milton has described as "the gateways of knowledge". These are the sense organs for vision (eyes), hearing (ears), taste (tongue), smell (nose) and of touch (skin).* Modern physiologists would like to increase the list by sub-dividing the sensations further; the touch sensation, for instance, has been divided into touch, pain and temperature.

Before proceeding to describe the functions of the different sense organs it would be worth-while to examine the similarities we witness in the sense organs in general.

Firstly, the organs participating in the sensory mechanism are receiving apparatus in the sense that they receive the impressions of the external world. The eyes receive the impression of light, the ears of sound, and so on. That is why the sense organs are also called *receptors*.

Secondly, the sense organs to be roused into action require the aid of a sort of an agent. This agent for the visual organ is light; the eyes could not function in absolutely dark room, a minimum amount of light is necessary for them to operate. Similarly, to produce the sensation of touch an object must be in physical contact with the skin. The general scientific term for such agents is *stimulus*.†

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* It is curious to note that the five sense organs described by the early Hindus as the *panchendriyas* hardly need any modification in the light of our present day knowledge.

† The word stimulus should be distinguished from 'stimulant'. While the former is the object or energy needed to allow a receptor to function, stimulant is usually a drug or chemical, as present in tea or alcohol, which enhances bodily activities.

Thirdly, each sense organ can function only when a specific kind of stimulus acts against it. The eyes as receptors can perform their job only when light rays strike against them; for the ears to hear the stimulus must be sound waves, and so on. That is to say, for each receptor there is a *specific stimulus* which alone could cause that particular sense organ to function.

(*b*) *The Connecting Mechanism*

All the sensory organs are ultimately connected to the brain, and the nerves form the necessary links. The brain in its turn is connected with the response mechanism.

(*c*) *The Response Mechanism*

On suddenly coming out of a dark room into the open the eyelids shade the eyes in a characteristic manner while the pupils narrow down considerably. A sudden thunderclap not only causes the sensation of hearing but, also, may cause the man to crouch. To use scientific expression, the pupils of the eyelids, and the muscles of the body in general respond to a sufficiently strong stimulus. The organs which yield a response of one kind or other due to the effects of a stimulus are known as *effectors* since they manifest the effects of stimulation.

The gross systems of the body then could be summarized into three categories, viz.,

affectors or *receptors*—the sense organs,
connectors—formed by the nerves and the brain,
effectors—the muscles and glands which respond to the stimulus.

These we would now consider in further details.

THE SENSE ORGANS

(*i*) *Visual*

Looking from outside each eye appears to consist of a round muscular ball partially visible between the eyelids. The white coating is known as *sclera*. Its surface ends with the dark coloured cicular disc or the *iris* which bears an aperture at the centre. It is this central aperture which is referred to as the *pupil*. Touching with finger the pupil cannot be felt due to the fact that it is covered with a smooth transparent membrane, the *cornea*. If the eyeball were dissected in the middle running from the top to the bottom two longitudinal sections would emerge and each of the halves would appear as shown in the diagrammatic sketch below (Fig. 5).

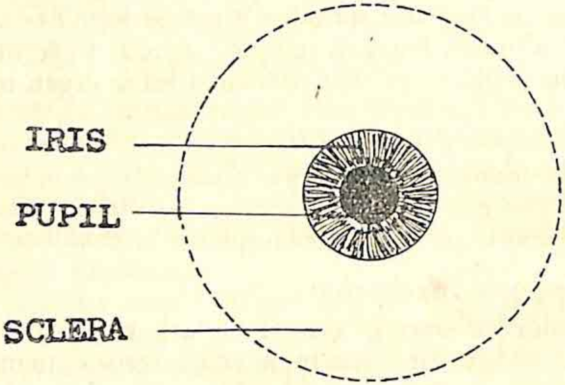

FIGURE 4.
EXTERNAL VIEW OF THE EYEBALL.

Immediately behind the iris and the pupil there is a transparent *lens* supported by two short muscles. The bulging portion of the eyeball is filled with a viscous fluid to keep the internal parts held secure in their place. The inside wall of the eyeball, the *retina,* consists of specialized cells which are highly sensitive to light waves. The photographic camera is perhaps the only apparatus built by man which shows a good deal of resemblance with the human eye, and yet, how clumsy is man's attempt.

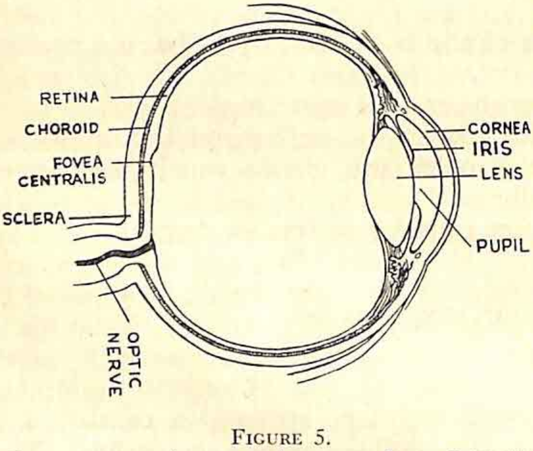

FIGURE 5.
CROSS-SECTION (SIDE VIEW) OF THE LEFT EYEBALL.

Lest the images on the camera film or plate be spoilt by too strong or too faint light arrangements are therefore made for the shutter to control the amount of light that passes through. The iris functions exactly like the shutter with the only difference that it does not wait for our guidance to operate it. The retina being a highly sensitive mechanism has to be saved from injury that may be caused by strong light. When the eyes are faced with a strong beam of light the muscles of the iris expand and leave a small aperture for the light to enter. For an object to be clearly visible in the dark there is needed comparatively stronger light and the iris then contracts leaving a dilated pupil. These strange changes in the iris can be clearly observed if one looked in the mirror while bringing a lighted electric torch near the eye from the side of the temple.

The light entering the eye passes through the lens and thus is produced the sharpest image. When the object is placed at a distance the lens is slightly flattened, and is thickened when the object is placed close to the eyes. Thus one lens in the human eye can serve the purpose of several artificial lenses of different focal length which would be necessary for focussing objects placed at varying lengths.

Passing through the cornea, pupil and the lens, the light from the object now strikes the retinal wall. While the impression of the image on the plate or the film in an artificial camera is retained permanently, the image formed inside the eye stays there as long as the object is held before the eye. Besides, formation of the image on the camera plate is the final act in the process of taking a picture, whereas it marks only the beginning of a series of other functions in the human eye.

The light rays by striking the retinal cells produce chemical changes in them which in their turn give rise to impulses of electrical nature. This impulse travels through the fine *nerve endings* attached to the cells. These fine nerve tendrils intertwine to form the *optic* or *visual nerve* which ultimately enters the brain.

As to what happens to the nervous impulse carried to the brain remains still a mystery. Factual evidences go to indicate that this impulse, which is physical in nature, is transformed into its psychological counterpart we call *sensation*. It may be asked here, how could it be proved that this transformation takes place inside the brain and not in the sense organs?

With the eyes and nerves remaining intact if that part of the brain where the optic nerve makes its entrance (see Fig. 8) is seriously damaged due to injury or disease, visual sensation would cease to be produced. But the brain remaining intact even the damaged eyes could not altogether stop the sensation from being evoked provided the connecting links of the nerves were in order. If the eyes received a physical impact like a sharp blow (even when the eyes were damaged or remained closed) a flash of light would be seen. Thus it may be concluded that it is the brain which is ultimately responsible for producing sensation. To have an exact and complete picture of an object, however, the eyes need to cooperate. Thus is provided a good illustration to show how the structural units in the living organism integrate to form functional units. The eye by itself is a structural unit, but it must work in cooperation with the nerves and the brain for its functioning to be complete. Not only that, both the eyes must function together in order to produce the experience of depth or distance. Try to reach an object placed at an arm's length with one eye closed, and it would become obvious that assistance of the other eye is necessary for correct assessment of distance.

DEVELOPMENT OF COLOUR SENSE

Investigations go to show that babies at birth cannot distinguish one colour from another. If an infant reached for an object of a particular colour it is due to the brightness of the colour and not for the colour itself. A ball painted with dazzling vermillion, for example, would be preferred over one painted with red ink which is less bright. By the ninth month, however, preference for colour develops to a marked degree. Judging, in order of preference, red is the most sought for among the colours at this age, followed by yellow, then blue, and green is the least liked colour though green is brighter than blue. Gradually individual difference distorts this order of preference. Choice of colours begins to vary in the individuals according to the different colours with which he comes into contact, e.g., through toys, etc. Still, there remains a certain amount of unanimity among the children of two years in respect of choice of colour scheme, the order of preference being red, blue, green and yellow, whereas the usual preference among the adults is blue, green, red and lastly yellow.

(ii) Auditory

The ear as the receptor for sound is somewhat more complicated than the eye. The *external ear* is the muscular part which aids in collecting the maximum amount of air vibrations to be sent inside the ear and vibrations are the source of sound, the specific stimuli. This function of the external ear can be observed more clearly among the animals who wag their ears for the needed adjustment in order to receive the maximum of the stimulus. The *middle ear* is the small canal which starts inside the external ear and ends against what is known as the *ear drum* or *tympanum*. If the round end of a match stick were gently pushed inside the ear—a dangerous practice frequently enjoyed by many—on coming into contact with the ear drum it would produce a crackling sound. The drum functions in the same manner as do the membranous covering

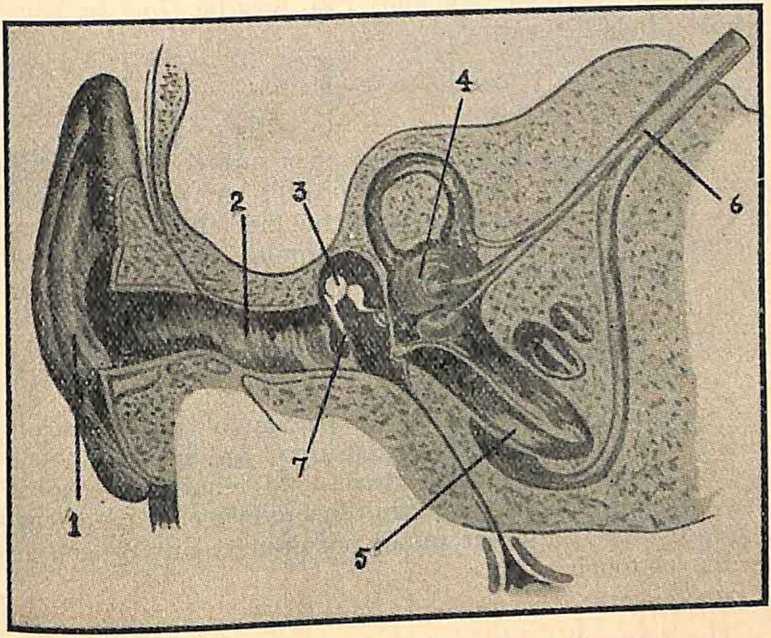

FIGURE 6.
TRANSVERSE SECTION THROUGH THE RIGHT EAR.
1—Pinna; 2—Ear-hole; 7—Ear drum; 3—Ossicles; 4—Vestibule with the semicircular canal; 5—Cochlea; 6—Auditory nerve.

of the *tablâ,* that is, by producing magnified vibrations on the other side of the membrane. The air on the other side of the ear drum is thrown into sympathetic vibration of the same order and is carried over through complicated paths to that part of the *internal ear* which is known as the *cochlea* (Fig. 6). Inside the cochlea there are rows of fine elongated cells of varied length known as *hair cells,* so named for their resemblance with hair. These cells are thrown into vibration as the air vibration reaches them. They function like the side-wires in the *sitâr* all of which do not respond to the same tone; only one of the hair cells or a limited few may respond to a particular tone. The hair cells have nerve endings attached to them which join together to form the *auditory nerve* ending ultimately at the side of the brain just as the optic nerve ends at the back of the brain.

What has been said in connexion with the production of the sensation of vision as a sub-unit in relation to the functioning of the mind in its totality could be applied to audition too. The ear has different structural parts each having a specified job, but all these functions fuse together for the ear to act as a whole in hearing.

OTHER SENSE ORGANS

(*iii*) *Gustatory*

The tongue contains on its upper surface small dimples inside which are the specific types of cells known as *taste buds,* for evoking the sensation of taste, but not all of these would respond to the same kind of stimulus. Bitter taste, for instance, is experienced only at the back of the tongue where the taste of sweetness would fail to be produced and for which the taste buds at the tip of the tongue are reserved.

(*iv*) *Tactual*

The skin can originate the sensation of touch, warmth, cold and pain. For each of these there are specific spots on the skin, but for each kind to respond requires the specific stimulus. Some spots on the skin can produce only the thermal difference while the other would not produce any other sensation but of touch.

(*v*) *Olfactory*

The protruding part of the nose functions in the same manner as does the external ear for hearing. It collects as large a quantity of the stimulus inside the nostril as possible. At the upper part of the nasal cavity are situated the olfactory cells which on being contacted by the smell particles carried by the air help in producing the smell of the object.

THE CONNECTING MECHANISM

The nerves in their functions bear similar relation to the body as do the wires and cables in matters of defence of the country. The nerves carry messages from the sense organs to the brain bringing it into contact with the external world. Also, they convey the impetus for the different organs and limbs to act when the necessity arises. As it may be seen in the cases of paralysis, the organ despite its structural integrity ceases to function because of the nerve supply to the organ being cut off. It is said that thinking leads to doing; if the brain is the mechanism which is related to thinking and reasoning it also tells the other parts of the body how to act on the bases of the thought processes. For the purpose of carrying messages to the body, and also from the body, there are two sets of nerves. Those which carry the impulse from the sense organ to the brain are called *afferent** or *sensory nerves*, and those which carry the impulses from the brain to the peripheral parts of the body are called the *efferent* or *motor*† *nerves*. Some of the nerves on emerging out of the sense organs go straight to the brain as is the case with the optic nerve. Many others have to pass through the *spinal cord* which is encased in the back-bone or the *spinal column* before

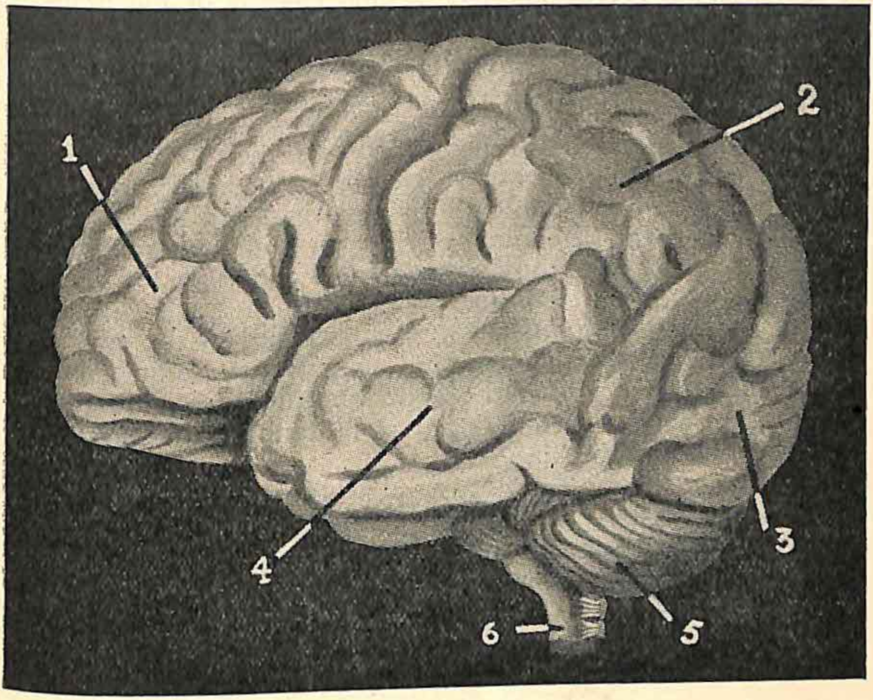

FIGURE 7.
VIEW OF THE BRAIN.
1,2,3,4—The lobes of the brain—Frontal, Parietal, Occipital and Temporal; 5—The cerebellum; 6—Base of spinal cord. Note the folds on the surface, these are *convolutions* separated from each other by the *fissures*.

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* Afferent means 'conducting inwards', efferent means 'conveying outwards'.

† Pertaining to movement.

joining the brain. This happens in the case of those nerves which come out of the limbs and intend to reach the brain. The spinal cord, therefore, acts as a sort of 'main line' in the electrical wiring system.

Thus, the nervous system we find consists of the brain, the nerves, the spinal cord and the sense organs. For our purpose the most important among these is the brain.

The Brain

Looking at a model of the brain (Fig. 7) the two parts most conspicuous appear to be the *cerebrum*—the larger and the uppermost part—and the lower and the smaller part, the *cerebellum*. It is the cerebrum which possesses the most dominating influence over the nervous system and it is this organ of which we are least informed.

The cerebrum consists of two lobes joined in the middle. The upper layer of the cerebrum, slightly greyish in colour and called the *cerebral cortex*, appears to influence most significantly the various mental functions beginning with sensation to reasoning and thinking.

Another characteristic feature of the brain lies in the *localization* of its functions. As stated earlier, all the nerves ultimately find their way into the brain, but each has a specified location for itself (see Fig. 8). The optic nerve for example

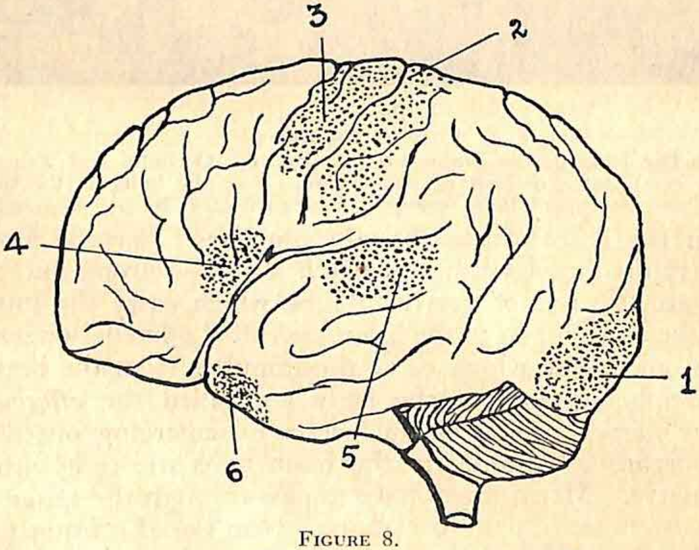

FIGURE 8.

LOCALIZATION OF CERTAIN FUNCTIONS IN THE BRAIN.

1—Visual area; 2—Sensory area; 3—Motor area; 4—Speech centre; 5—Auditory area; 6—Area for smell and taste.

enters at a definite region in the rear part of the brain; likewise, the motor nerves emerge out of a fixed area located between the top and the side of the brain. Observations have proved that each part of the cerebrum has a specified function to perform. On the cerebral cortex we may locate the motor areas (responsible for movements of the limbs and the body), speech centre (which if were seriously injured would cause stoppage in speech), visual area (responsible for the sensation of vision), and so on.

The Cerebellum

Though situated close to the cerebrum and included in the brain, the cerebellum takes no part in what we call intellectual activities. It is mainly responsible for maintenance of the physical gait and balance in the body movements. Cerebellum of the lower animals when is removed from the body shows the animal moving as if it were drunk and loses all sense of bodily equilibrium.

THE RESPONSE MECHANISM

Muscles and glands inside the body constitute its main response mechanism. Attached to the bones the muscles aid in the movements of the former. In spreading the palm the finger muscles become taut proving thereby that their contraction is necessary for the fingers to be spread out. In holding the pen a different type of movement is required, it is mostly the muscles at the back of the fingers which now contract. That is to say, in the extension of a limb one set of muscles contract and the opposite members relax; in flexing the same limb the process is reversed.

Glands are defined as organs which produce secretion* helpful to the organism in one way or other. Liver can be taken as one of the most widely known among the glands. Bile, secreted by the liver, is essential for digestion. Though all the glands have their specific function in the body they bear resemblance in one respect of structure. Their products are carried to the destination through fine channels or *ducts* as they are called. But the glands belonging to another category are characterized by the absence of any duct. Their secretion is absorbed directly by the blood and is carried to the different parts of the body through blood vessels. By virtue of this fact these glands are known as *ductless glands, hormone bodies* or *endocrine organs,* and the chemicals they produce are called *hormones.*

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* Excretions on the other hand, are the products which the body must eliminate lest harmful effects may be produced.

Each of the endocrines though insignificantly small in size has been found to produce disproportionately important effects on the organism, so much so that popular writers in science have sometimes described them as the glands of destiny. A few of the important ductless glands are mentioned here.

For educational purposes acquaintance with the *thyroid gland* would be of interest. Inconspicuously situated on the two sides of the wind pipe at the base of the neck the thyroid produces tremendous influence over the growth of the mind and body. Though not more than a few grammes in weight, the thyroid if failed to grow to its normal size during childhood the physical growth of the individual would remain arrested thereby producing dwarfish effect, and his mental development will also be retarded. In normal cases the growth of intelligence accompanies the physical development, but in the boys and girls suffering from defective thyroid this balance is not maintained, with the result that the adolescent may be seen behaving like a child of much lower age. Such individuals are called *cretins* and the characteristic mental and physical symptoms are designated as *cretinism.* However persons with overgrown thyroid are not compensated by superior intelligence. Medical science can now offer excellent help to the cases of hypothyroidism (underdevelopment of the thyroid) by administering thyroid extracts from other animals. Amazing results have been observed in the return to normality in these cases.

The *pituitary body,* a pea like organ situated at the base of the brain, if grew more than its normal size is liable to give rise to physical conditions described as *gigantism.* Growth of the bones and joints being positively related to the amount of pituitary available to the body, excess of this gland's secretion lengthens the bones and thickens them abnormally. And yet, all these curious changes are not wrought by the glands as a whole but only by its insignificant looking anterior part. The posterior part of the pituitary gland if failed to develop to the normal extent would lead to the retardation of intellectual and sexual development.

The *sex glands* in the males and females both have dual functions. A part of the sex gland (testes in the male and ovaries in the female) which has ducts is related to the act of impregnation. The ductless part of the sex glands if remained underdeveloped would lead to the retardation of the secondary sexual characteristics. In such cases the male would fail to grow beard and his voice would remain uncannily childlike, while in the female breasts and hips would fail to mature.

We have now come to the end of our search for the physical counterparts of the mental life. Mind does not function *in vacuo*, all those experiences which we ascribe to the mind are related to the functions of one or several parts of the body, and it was our intention to find and locate those organic units which are directly or indirectly connected with our mental life. In doing so, however, greater stress was laid upon the structural aspects and their individual functions. We have examined the organs as they appear to be and as they operate. But human behaviour, in which our interest mostly lies, when viewed in its dynamic forms raises new issues. It is misleading to conceive man's behaviour as consisting of mere functioning of this or that organ. Human behaviour cannot be analysed into the actions of some nerves plus muscles plus . . . It was this erroneous conception which had caused the structural psychologists to forfeit their future.

Organs inside the body do not act mechanically. The human organism could hardly be compared with a machine, if at all, it is to be considered as a very complicated form of self-winding machine which knew when to wind itself, how, and to what extent. Without being fully aware of the situation, for instance, one lightly brushes away the ant crawling over the neck, removes the finger with a jerk when it comes into contact with fire, and runs away when faced with a wild beast. These actions though of variegated nature lead more or less to similar results, viz., in the removal of discomfiture or in removing oneself from the source of danger. All these actions appear to have a purpose in view, a biological end to attain. And to study the human behaviour and seek the purpose that these actions served is the main task in psychology, only then could we predict how the man would react to a particular situation.

CHAPTER IV

SENSE PERCEPTION

The beginners in psychology have to face a good deal of confusion caused by the technical terms borrowed from our everyday vocabulary. The word sensation is a good example. The ink-pot on the table we see through our visual sense organs, and so the object is said to evoke visual sensation. For the sake of accuracy the word perception would be more appropriate. It does not thereby mean that the phenomena of sensation and perception are not interrelated, as a matter of fact it is the one which leads to the other.

DEVELOPMENT OF PERCEPTION

An infant of two months would not perceive the ink-pot in the same manner as would an adult. Whereas the infant would experience only the visual aspect of the object an adult would see something beyond that. The adult will be acquainted with the other properties of the object, e.g., its shape, hardness, colour, smoothness, etc. The infant would not know if the object was hard like the spoon, if it tasted bitter or sweet, and of course would not be aware of the functions that the pot served. At this age for it there may exist no difference between deep and light shades of red, or between a red ink-pot and a red toy. All these stimuli merely end in stimulating some of the cells in its eyes, that is why the child endeavours to reach for the red coloured lollypop as lustily as red flames of fire. This psychological experience of 'just one more thing' could truly be called sensation. The adult seldom has a similar experience. If the child were allowed to handle the ink-pot freely it might begin to learn that it resembled other objects in certain ways and differed in the rest. This experience of discriminating each object as a separate entity will keep on growing with its age. As the fingers grow in strength it will find that it is more difficult to hold the ink-pot than the small toy. The muscles and bones of its tiny palm may develop in the co-ordination to the extent of holding the toy but not the ink-pot. Again, by striking it against the floor the pot would shatter into pieces unidentifiable with the original object and in this respect the pot, it would learn, differs from the wooden toy which on breaking does not become unrecognizable. In brief, the more it handles the ink-pot the more it would learn about its different aspects unknown before and these experiences it would gather through the different sense organs and will be stored in its mind. But these experiences do not remain in isolated mental compartments, they cohere together to form a meaningful whole. The object thus acquires *meaning* for it and this is the essential fact which makes all the difference between sensation and perception. Instead of remaining confined to isolated spheres in the mind when sensasions combine together to produce a definite meaning of the object it is known as *perception* in the psychological sense of the term.

The adult rarely experiences pure sensation, instead he perceives ; looking at the ink-pot he takes the cue, and the value of the object in its various aspects immediately becomes clear to him. Likewise without examining the source he can distinguish the red glow of the fire coming out of the oven from the light of the electric torch or the faint sun beam coming from behind the clouds, they are all different percepts to him. This difference in his mind is caused by his past experience of each individual object which he has had.

The psychological qualities of the material objects have come to be so closely associated with the objects themselves that in his daily life man seldom tries to distinguish between the two things which are treated as synonymous. Sugar is indentified with its psychological quality of sweetness and the latter with pleasantness—another psychological quality—so closely that it is taken for granted that sugar is always pleasant. Let any one say that sugar is not pleasant in taste and he would be regarded queer. Yet such cases are not altogether rare. While working with the Indian Medical Mission which was sent to China in the thirties one of the doctors, who narrated this incident to the writer, had observed that the children in the remote parts in that country unlike other children did not relish sugar when offered, they spat it out with apparent disgust. The reason for this strange behaviour was not far to seek. Due to the war conditions then prevailing there sugar was not available to most of the children born within this period with the result that the psychological abilities to appreciate sweetness had remained undeveloped in them.

From the above an erroneous impression might possibly be created, viz., in perceiving an object the child analyses the component stimuli in its mind ; nothing would be farther from the truth. Let us consider a specific case. The child when sees a cow for the first time perceives it as a moving object of certain colour, with the extremeties of varying form and size, and so on. It acquires knowledge of the legs, head and the tail not as objects isolated from the cow but *in relation to the animal,* these are parts integrated into a whole and it is the integrated whole which he perceives. Gradually it learns that it emits strange sound at times, this experience is added to the previous ones acquired, again, that it poduced milk and the child's experience is further enriched. But all these experiences are related to the cow as a whole. Perception in it grows from simple wholes to more complex wholes with new qualities constantly integrating with those which were already known to the child, each addition enhancing the meaning of the percept.* Experience grows with the acquirement of new percepts.

But such knowledge does not grow of its own accord. When a child perceives a new object for the first time in its life it tries to examine it from every possible angle and in all its aspects. What value would have a pen unless it tried to hold it in every possible manner (thus perceiving its size, shape, etc.), peer at it (and perceive the colour quality), and even taste it (thereby enriching its perception further). It comes to learn that the pen is after all not a useful object for sucking, nevertheless the object could be utilized as a drum stick, at any rate that is what it feels. It is only much later that it learns to perceive the pen as an appliance for writing and tries to make use of it (or misuse?). Perception, therefore, does not grow out of passive functioning of the sense organs, it develops out of striving and pursuing actively.

How is it that a child endeavours to know all about the pair of spectacles lying out of its reach while ignoring the spoon near it? It is interest of course which drives it to know the hitherto unknown. A new object offers greater interest and so more attention is paid to it. Perception can grow only when definite efforts are made, and of this there is little possibility in the absence of inherent interest.

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* Commonly *percept* means the object perceived. But it has another meaning. Students of philosophy would like to sever the quality from the object and consider it as a separate entity. The red colour of an object we usually refer to as a quality. But in philosophy it is given a separate status and identified as a separate entity, redness itself then becomes a percept. A percept then is not only the object perceived but, also, the quality of the object. The common definition however would serve our purpose here.

Perception then depends upon interested efforts made by the individual. Even then, however, there arise occasions when the object fails to evoke correct perception. The two central lines in the Fig. 9, would almost invariably be perceived as of different length. In view of the fact that this error in perception is common to all it is not conceived as an "error" in the usual sense of the term but as a specific category of perception, false perception. Such cases are referred to as *illusion*. Illusion has been defined as a misrepresentation of certain elements in a given experience, such that the experience does not represent the objective situation present. It is on the basis of such illusions, as we shall see later, that the perception of movement is evoked.

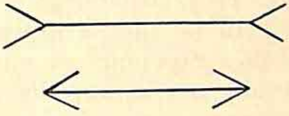

FIGURE 9.
MULLER-LYER ILLUSION.
Which of the central lines is longer?

Nevertheless, in illusory perception or illusion, the sense data are existent, only they are differently interpreted. But there are occasions when perception takes place in the absence of the sense data. To see a piece of rope as a snake in the dark is a case of illusion but it would be called *hallucination* when a patient in high fever shrieks on 'seeing' snakes crawling around him. Hallucination is a case of false perception without any stimulus present. Illusions are normal phenomena whereas hallucinations arise of abnormality, temporary or permanent.

FORMS OF PERCEPTION

In perceiving an object more than one category of sensation is used. Perception of a watch starts with the visual sensation but it does not end there. To the visual sensations are added the auditory and the tactual sense impressions. The sense data gathered from more than one sense organ go to build up complete perception of an object. Yet a particular sense organ may produce predominating influence over the rest in perceiving a certain object. A perceptual process is named after the sense organ which might play a more dominating part in evoking the perception. It is a case of visual perception when the watch is seen, and auditory perception when its ticking is heard though both at one time had played their part in building the total perception of the watch.

EDUCATION AND SENSE TRAINING

Education starts with the acquaintance with the external world. The various systems of education at the initial stage merely provide opportunities for this acquaintance to grow systematically and thoroughly with the least difficulties. Since man's opportunities to learn from his own experience are unlimited education has been rightly called a lifelong process; education *is* living.

This acquaintance grows out of actual sense perception. It will be in the fitness of things, therefore, to broaden the child's experence as much as possible and in a manner which would not cramp its interest and curiosity but widen the orbits.

Even when left to itself a child seldom fails to take the opportunity to learn about the external world. Readily it will grasp the object lying near it or make unceasing efforts to reach it if it is out of its reach, and as soon as its language mechanism is developed it would pester the parents with the question 'what is this'? The elders usually use language not much intelligible to the child, after all, language is a symbolical expression of the ideas and experience, whereas, the child is still at the formative stage in the growth of these ideas and experiences. When the child is told that the toy in its hand is an 'elephant' it makes little difference to its ignorance, 'toy' is a generic name which it cannot grasp, and elephant it may not have seen. Consequently, the child proceeds in its characteristic way observing the article from every possible angle and in all its aspects. It is by chance that it strikes the object against the hard floor and the sound emitted it enjoys as something new and it repeats the performance. They toy unable to maintain its integrity breaks into pieces offering the child further opportunities to explore the inside of the article. The broken pieces enrich the experience of the child furthermore adding to the perception already acquired. All these experiences would now be retained in its mind, not as isolated pictures but as a whole, as a *pattern of experiences*. And this pattern would differ in more than one respect when the child comes across a rubber or a wooden toy. Objects differ in their qualities or properties. For instance, rubber is elastic, earthen toy is brittle, and the wooden toy has a different property in this respect. All these materials produce different combinations of sensation when touched, smelt and tasted, and these reflect different qualitative patterns. The child certainly does not analyse the properties into their components as it has been done here, it experiences them in their totality. Education during the earlier stages consists of acquainting the child how the different objects present varying arrangements of the properties inherent in them.* A simple experiment may convince how a minor shift in the arrangement of the same qualities may produce significant difference in the resultant effect. The four patterns in the Fig. 10, are born out of four straight lines

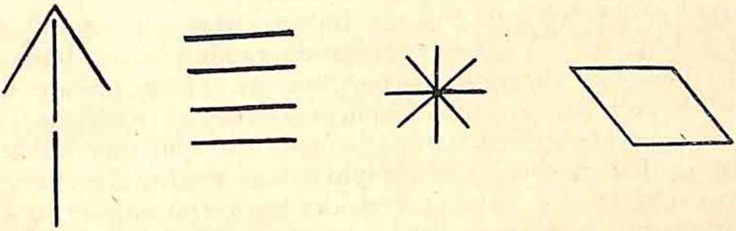

FIGURE 10.
Each object which we perceive is a combination of sensory qualities arranged in a specific pattern. How many figures could be drawn out of four straight lines of equal length? Here are four illustrations.

of the same size, shape and colour, and yet, each pattern has a different meaning. We may now realize the immensity of the task that faces the child in gaining experience. The knowledge that it accrues through material objects it will have to use later in judging human behaviour. A face reflecting anger it learns to discriminate from one expressing joy. By observing it discerns the two different patterns of facial texture combined with the voice quality. It may be argued that this the child could do even if it had not received any education. True, even the animals do understand the significance of such differences in the human or animal behaviour. But the human society demands much more. The child of today as a civilised man of the morrow would be required to catch those subtle hints which are the outcome of an insignificant gesture. For instance to recognize the signs of a polite disapproval certainly it requires training.

Again it is on the effective training for finer discernment that the æsthetic development in the child would depend.

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* Toys in this respect have a significant contribution to make; these may be considered as educative apparatus. Unfortunately there is a good deal of misunderstanding existing regarding the toys as educative appliances. It is not the intricacy or beauty of the toy or its cost which should be a matter of concern but the effects that it produces in the child's mind. Usually, however, the parents in selecting a toy think more about themselves than the utility of the article for the child.

The proportion of the two lines in the patterns in the Fig. 11, are the same and yet they produce different æsthetic qualities. Likewise, all the tunes employed in songs are nothing but varying combinations of some fundamental notes and yet the combinations could be of infinite variety and significance.

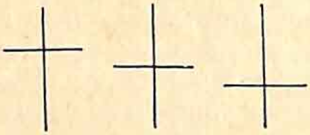

FIGURE 11.
Which of the three patterns is pleasing to the eye?

Judged from the standpoint of sense training as a basis of education the theoretical contributions of Rousseau and Froebel, and the practical applications made by Montessori are remarkable indeed. But it should be remembered as a warning that mechanically applying their teaching reduces its values. Many, for instance, consider sense training as an end in itself, but it is not a ritual which could be dogmatically applied without any concern for other mental aspects or the need. At the initial stage of exploring the world the child is delighted to view the world around, but a stage would be reached when this interest would be diminished. Counting the beads and playing with the cubes may serve useful purpose at a certain stage of the child's mental development but the limits should not be forgotten. After all, man seeks purpose in his acts. If the child had evinced interest in its earliest inquiries in the domain of sense perception it was with the vague purpose of gathering knowledge regarding the world. A time would come when it would feel that it has had enough of it, and then there would appear a slackening in its interest. Consolidation of its knowledge would now be required. The next stage of its learning should be explored. The sagging interest could be revived if it were next taught how to make use of the knowledge it had initially gained. If up till now it had been daubing paint over paper it should be next taught how to make use of these colours. It should learn, for instance, that leaves of plants should not be painted red nor the moon black, and the whole drawing of the hut drawn could not be filled with the same colour all over. In other words, in sense training we should seek for new objectives, enhance observation and look for purpose and reasons in the actions of the child.

His efforts must have some end in view and a definite programme should be laid down in matters of sense training. To train the child in its kinesthetic perception, for instance, it may have been worth while at one stage to allow it to walk with a glass of water with the instructions against spilling it. But very soon it would grow tired of such educational gymnastics. If, on the other hand, it were taken into confidence as a companion and its assistance sought in the innumerable daily little acts in school and at home it would enjoy sharing responsibility, develop its sense of dignity while accruing perceptual training. While the father is kept busy nailing a packing case the child would take pleasure in standing by, but it would be immensely happy to act as a standby with the supply of nails in its hand and taking its turn now and then in hammering the nails. Correct perception is aid to what is called practical training.

Perception also gives rise to the concept formation. During the early stages of its life a child cannot distinguish the leg as a separate entity. In the case of the adult the word leg for instance does not bring in his mind the picture of any particular animal, leg for him has its own identity. How did the concept of leg grow in him? During its earlier stages the child does not pay any particular attention to the legs of the cow. Only when it has had sufficient experience of the cow as something different from other perceivable objects that its attention is diverted to the specific features in the animal. It learns to distinguish it from other animals and it observes the legs of the different animals more closely than before. Along with the synthesis in perception to the higher level grows the analytical trend. It learns about the similarities and the distinctive features between the legs of the cows and men, ducks and dogs. These experiences cohere in its mind to give rise to the *concept of the leg* which now comes to possess its separate identity and it is an entity different from the head or the tail. The word leg need not now arouse in its mind the leg of any specific organism. This is the genesis of *abstract ideas* with which the educand would have to be familiar. Literary criticism, moral issues, æsthetics, algebraic quantities are some of the instances which are dependent on the abstract concepts.

CHAPTER V

UNLEARNED BEHAVIOUR

CHARACTERISTICS OF THE LIVING

The first characteristic of the living is its *physical development*. The living being develops according to certain definite principles. Existence in itself is not an end, it is a means to an end, the end lies in the development of the organism. The mode of development is, however, not the same in all organisms. In the moths and butterflies, for example, there are distinctively demarcated stages in the developmental process, and each is unrecognizable from the other. Whereas, the developmental stages from the infancy to the adulthood are not distinguished by any abrupt change.

It may be questioned that similar changes are, also, noticeable in the inanimate. The Himalayas, for instance, have been observed to be rising in height ; the areas which once were submerged under the seas now form the deserts. These are manifestations of development no doubt, yet such transformations are intrinsically different from the developmental changes we witness in the living. In the latter, development is real in the sense that the original germ cell goes on dividing unceasingly and these grow into clusters of cells each to have specific functions to perform, they wither and die in the course of time yielding place to fresh cells, this is the way of the living. Whereas, in the case of the hills and mountains the changes occur only under internal pressure, the process is therefore mechanical. *Internal growth* then is the first characteristic of the living being.

The second characteristic in the living is its *ability to modify itself* according to the demands of the situation. The organism is capable of regulating itself in health and disease. If one of the lungs, for instance, were incapacitated the other one would take upon itself the function of both ; for the perception of depth and distance both the eyes require co-ordinated functioning, but one of the eyes if were damaged the other eye would gradually adapt itself for correct perception of depth ; the body is constantly adjusting itself to the rigours of extreme temperature and humidity, starvation, fatigue and exhaustion provided these are of not very serious nature.

The third characteristic feature in the living is the *purpose* *in action.* The most complex of the calculating machines working out complicated formulæ with amazing speed could do nothing beyond repeating the operations as desired by its manufacturer. In comparison, the constructive activities of the crow in building its nest are qualitatively different; the bird has a goal before its view. It *selects* a particular site, *tries* to pick up only those twigs which would be useful for its purpose, and is not satisfied unless it had attained its end. From this point of view all the living beings, not excluding the unicellular organisms, show an uniformity in their actions. there is a purpose behind their behaviour.

Consciousness is the fourth and the most important of the characteristics in the living. We not only act and think, modify our actions, and strive to attain a specific end, but we are also aware of our actions and thoughts. It may be argued whether all the living beings—in contrast to the non-living things—possess consciousness. We cannot enter into a polemic here, nevertheless it is an accepted hypothesis that what exists has its beginning. If man as the superbeing on the earth's surface possesses consciousness its rudiments may exist even in the lower animals provided there exists a reasonable amount of organic similarity.

To sum up, man does not exist as a static object, its existence is given dynamic expressions. He is *born to act* and this he does right from birth or even before it. It is admitted that he also *learns to act* in many ways, reading and writing as for example. But then he could not hold the pen or utter words had he not possessed the initial capacity to act in these manners. In this chapter we intend to examine the various modes through which man expresses himself, those behaviour patterns which do not have to rely upon training or learning.

TYPES OF BEHAVIOUR

As it has been mentioned in the above, human behaviour could be broadly classified into two categories, viz., those which are inborn and those which have to rely upon training in one form or another. It does not require formal knowledge in psychology to notice the gross difference in the behaviour of the infant and the adult, or, between the man and the lower animals. A new born infant like the young ones of other animals has to rely for its existence solely upon those modes of behaviour with which it was born. But the child as it grows adapts its original behaviour pattern to meet the demands in life, that is, it learns many more. It is in this respect that the animals lag behind the human beings. Blinking of the eyelids is a form of behaviour but is altogether different from the behaviour required in playing on a flute ; likewise are different the actions born out of thinking and the outcomes of rage and passion. The inexhaustible list of the innate actions in our everyday life may appear to defy any effort to classify them. Nevertheless, many of these bear close resemblance and they could be put in the same category.

1. *Automatic Actions*

These could be described as the simplest type of innate behaviour. As examples could be cited the actions of heart and lungs. The heart of the frog even after its severance from the body continues to throb for a considerable length of time. This kind of action requires no guidance or direction from any other part or organ of the body. The heart's actions are self-propelled, uncontrollable, it could not be induced to alter its mode of functioning.

2. *Reflex Actions*

Judged in order of complexity reflex actions belong to the next category of behaviour patterns. If one's arm were pricked unawares, the whole hand would be jerkily removed. Sensation resulting from the prick may be aroused comparatively later, that is to say, the act of removal of the arm may be unrelated to the consciousness that is evoked. In the reflex actions it is not the desire of the person that leads him to act in that characteristic manner but it is the structure of the organism which is responsible for such movements.*

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* Physiologically, what happens is that the impulse generated at the sense organ (skin in this case) travels up the sensory neurone to the spinal cord. There the main impulse is transferred over to the motor neurone which emerges out of the spinal cord. This motor neurone by virtue of its being connected at the other terminus with the muscles of the arm provide the latter with the impulse to act. The muscles on being stimulated immediately contract resulting the arm to jerk. Part of the impulse received by the spinal cord travels up and is finally discharged in the brain causing the sensation of pricking. But in this case function of the brain as an organ, responsible for producing the sensation remains secondary in comparison to the functioning of the arm. Such reflexes are known as *spinal reflexes* or *reflexes of the spinal level*. It is somewhat diffetent a case when under the influence of strong light iris of the eye contracts. The impulse in this case is discharged partly in the brain and partly to the iris muscles ; contraction of the latter and the concomitant consciousness of the light are caused more or less simultaneously. In view of the fact that the spinal cord remains unconcerned in this type of reflex, it is known as *reflex of the sensory level*.

We shall next examine the similarities and dissimilarities between the two types of unlearned behaviour. The reflex patterns like the automatic actions are inherited and the mechanisms involved are perfect at birth. Both help the organism in its existence and for its survival. But in the reflex actions—as distinguished from the automatic actions—it is not only that a larger number of bodily organs are brought into play but, also, the organism may become aware of the action. Another distinction lies in the fact that some of the reflexes can be modified. The pupillary reflex though remains unchanged, others like sneezing, yawning, hiccoughing could be controlled comparatively with ease. Modification of an action, however, does not consist of merely inhibiting its occurrence. A reflex action can also be modified by its influencing another action apparently unrelated. Here is an illustration. We all react to sudden loud explosion with a typical jerky gesture; under such a stimulus the heart beats faster, normal breathing is affected, the body muscles become taut, and so on; these are the expressions of the reflex action. Now a child if were taken in a dark room, to which it ordinarily reacted in a casual manner, and a sudden loud noise were produced it would react primarily to the noise and not to the darkness. But, if this experiment, cruel it would be though, were repeated on a few more occasions the child's normal reactions to the noise would be partly transferred to the dark room. In future such a person would not only exhibit fear reactions to the sudden noise but also to the dark rooms. This shift in the reflex is called *conditioned reflex*. We shall have further occasions to study it in connexion with the emotions.

3. *Instinctive Behaviour*

In the reflx actions the relationship between the stimulus and response is unambiguous. An adequate stimulus seldom fails to elicit the respective reflex. And even though the whole body may thereby be involved it is not difficult to locate those organs which bear the maximum effect. A strong beam of light when suddenly strikes against the eyes it may cause the head to be thrown sideways and the whole body may feel the repurcussions. Nevertheless, it is primarily the eye which receives the greatest impact of the stimulus. A sneeze shakes the whole body and yet it is the nostril which can be located as the centre of behaviour. It is from this point of view of physical location that the reflex behaviour can be clearly distinguished from that of the next one in order, viz., instinctive behaviour.

There is hardly any other word in psychology which has been used so often and misused no less frequently, gained rapid ascendance in popularity and declined with no less rapidity as the term instinct. Here are a few illustrations to show how the word has been put into varying uses: "He played on the flute instinctively", "The detective knew by instinct that he was on the right track", "It was her maternal instinct which helped her to recognize in the bush the lost daughter's voice", "Instinctively he had learnt to keep away from the danger", "It is the animal instinct in the man which turns him into a brute when angry". . . .

What criterion could profitably be used in the above illustrations to distinguish the instinctive acts from the non-instinctive? It has already been mentioned that the unlearned patterns of behaviour are fundamentally purposive, they aid in our survival and existence. This criterion could help us a great deal in differentiating the unlearned modes of action we call instinctive. A man's ability to play on the flute dexterously not only depends upon his training but, also, is of little significance to his survival, so also is the act of detecting criminals. The mother's action in tracing her daughter in the forest is directly related to the existence of her offspring, and it is in the survival of the progeny that the human race exists. So, this act on the mother's part could be correctly labelled as instinctive act.

The distinction between instinctive and reflex patterns of behaviour lies in the fact that the relationship between stimulus and reaction is not so clearly demarcated in the former as in the latter. Instinctive behaviour patterns are perfect examples to show that man functions in his totality. Appearance of a tiger on a bushy pathway may act as a visual stimulus, but it is the organism as a whole which reacts. Heart and the lungs now function more rapidly, the legs move more briskly, tenseness can be felt all over the body, thinking intensifies, emotion is heightened, and so on. All the organic and psychological resources are put into use here. It is this total behaviour which may be designated as the instinctive action in contradiction to the reflex actions manifested in one organ or another.

And, such occasions arise plentyfully in life. An infant is not taught to wriggle in order to get rid of the worm crawling over its thigh ; as much natural are its reactions to a loud report or for that sake to hunger and thirst. All these situations carry potentialities threatening the life of the child in varying ways. A child no matter to which nationality it may belong is not taught to seek company among the members of its own race (here the word race is used in purely biological sense). Sexual behaviour is not the outcome of any training. Love for the offspring is a natural urge equally in the panther and a woman. Instances could be increased *ad nauseum* to show that in their daily life the living beings are very much guided by certain *innate tendencies,* and that, preservation of the self and the race are the most important among these tendencies. How are these to be recognized? We should now seek for the characteristics of the behaviour patterns in the instincts.

CHARACTERISTICS OF INSTINCTS

The fact that instinct is an inborn capacity of the organism for it to function under certain specific situations should be held as the primary characteristic. It is equally present in the man as in other animals; man tends to run away from the danger as much as would a mouse. But we cannot fail to take notice of the fact that these instinctive acts in the man are much more flexible when compared to those in the animals. He would allow himself to be influenced by training in not running away. The tendency thereafter may remain but the behaviour pattern is very much altered. Sexual acts pertaining to propagation are instinctive, one need no training in this direction, and yet man stands supreme in the animal kingdom by virtue of his building the codes of morality and sentiments which entail self-denial and self-imposed inhibitions.

The second characteristic lies in the fact that all the instincts do not appear during the same period of development. Consequently the organic mechanism relevant to all the instincts for their expression are not ready at birth. Man's ability for construction is said to be due to one of these instinctive tendencies. But a good deal of perfection in the coordination in the muscles, joints and bones are needed for this instinct to be put into operation. So this instinctive tendency arises only when the body has reached that stage of organic maturity when any work of construction could be possible. Likewise, the behaviour patterns related to the fulfilment of sexual desires first are manifested during the stage of adolescence, attaining climax during a certain period of life, and gradually decline with age, and at least in the female it dies down completely with the end of the middle age. The last illustration brings out another interesting fact, that the instinctive acts when have fulfilled their purpose cease to appear after a certain stage even if the relevant organs retained their capacity to function. The adult retains his ability to play, using the word in the sense as we witness play in the child, but soon after his childhood days he gives up playing since the play activities no more profit the child physically or mentally. He may then take to games but the games, as it will be seen later, are something quite different from play.

The third characteristic is the emotional reaction manifested in the fulfilment or non-fulfilment of the instinctive behaviour. Even a superficial observation of the hungry child's behaviour when food is brought before it and if it were removed away soon after it started devouring, would convince an onlooker that emotional reactions are closely linked with the instinctive behaviour.

Holding in mind the observations made above, the most apt definition of instinct would appear to be the one offered by McDougall. "Instinct", he says, "is an innate disposition which determines the organism to perceive (to pay attention to) any object of a certain class, and to experience in its presence a certain emotional excitement and an impulse to action which finds expression in a specific mode of behaviour in relation to that object".[1]

This definition is so important and at the same time so often confused that it is worth while examining it more closely. The definition of instinct as postulated by McDougall could be divided into five sections each of which is interrelated with the rest. To begin with, instinct has been described as an *innate disposition;* we are born with certain organized tendencies to act. The body as a whole takes part in this type of action but each instinctive act is an organized whole to be easily distinguished from other instinctive acts. Such mental desires or physical actions do not require any training for their appearance or functioning. Once they have made their appearance, it is admitted, these may be influenced or modified, but the fundamental relationship between the situation and the action would remain unchanged. The mother's reactions towards her own child when it is hungry or in distress would not be changed while she may exhibit somewhat similar trends of behaviour towards other children.

The word disposition means tendency and it is the most significant expression in the definition. What is this tendency?

Let us consider another illustration. The water pipe may contain water but its flow may be checked due to more than one reason ; the tap may have been kept closed, or the palm kept pressed against the mouth of the tap, and so on. But it would not be wrong to say that the water inside the pipe possessed the *tendency* to flow in a specific direction, this is bound to be owing to the pressure maintained at the other end of the pipe. But an allusion should not be pressed too far. Faced with a situation threatening one's life all men would act practically on the same line, just as all mothers evince softness towards children. These situations create in the person a 'mental pressure', a tendency to act in a specific manner ; as to how the tendency would actually find its outlet it would depend on the particular situation.

The next three parts in the definition show that the instinct operates through joint functioning of all the mental elements, viz., cognition, affection and conation. The organism must *pay attention* to the object, and for this purpose there should be present a suitable situation. The tiger behind the bars of a cage and the tiger on the forest track do not present the same situation. Safe position of the onlooker in the first illustration fails to arouse the disposition of self-preservation ; the second one certainly offers such a situation. The object here, as used in McDougall's definition, is clear and unambiguous. But it may be enquired what is that object perception of which gives rise to the tendency of building nests in the birds? McDougall has offered a rather broad meaning to the word object. The definition will hold good, he says, "only when we take the word 'object' in the very widest sense, namely, to include not only material things and organisms, but also various situations in which the creature may find itself, consisting of internal and external conditions ; it is to be remembered that a large part of the sensory stimuli that play upon the sense organs come from within the organism ; and these constitute an important and constantly changing part of the total complex of sense-stimuli".[2] Following the act of mating, for instance, the bird can 'recognize' the presence of the 'object' inside its body, and this perception caused by the internal stimuli creates the conative desire or impulse to action required in nest building. But impulse is not the same thing as action itself. Faced with the beast in the bush a man may feel the impulse of running away. Whether the relevant expressions would be forthcoming would be determined by other factors. Very near the beast he may be too stunnned to run away; a *shikâri* might also act likewise, but for different reasons altogether.

If conation is preceded by the cognition the former is, also, accompanied by affection. As it has been said earlier, fulfilment or the non-fulfilment of each instinctive act causes pleasure or pain to the individual. And this affective aspect contributes substantially towards the performance of the act.

INSTINCT IN MAN AND ANIMALS

The myth that man's actions are guided by reason and in animals by instinct now stands exposed. As we have seen man is as much a creature of circumstances created by the instinctive drives as are animals. How then are we to distinguish man from animals in this respect?

If man differs from his biological cousins it is mainly in the complexities in the organic set-up. Standing at the top of the evolutional scale man enjoys the privilege of possessing a large number of variations in his behaviour. As we go down the scale we find that the behaviour patterns in the animal are more rigid while these are more flexible in the man. But the advantages of organic flexibility could not be fully utilized unless man knew how to make use of these facilities. This enriched awareness is closely related to the highly developed brain of the man. The result is that put into a trying situation man is apt to look for the different ways out when the behaviour of the animal would be more or less streotyped. The typical reactions in a rat on being introduced inside a cage would be to push the door, real or imaginary, and run hither and thither frantically. Man under similar circumstances might not be devoid of panic, but surely he would try to look around and ponder over the possible ways of getting out. The varying number of the probable reactions in the man would not only be larger in his case but these would, also, be closely related to the real situation of the problem, and this depends on the developed state in the mental conditions in man.

However, the difference in the two cases is quantitative rather than qualitative, just as there would be differences in the reactions between a clever person and one stupid. Intelligence, or common sense as we say, is an important factor running through all these cases creating the apparent difference in man and animal.

Instinct is merely the urge to act in a certain manner setting forth broad channels for its functioning; it does not lay down the detailed blue-print for attaining the goal. Hunger in a person may drive him to acquire food, this much is decided by the food seeking impulse and this is an instinct. Whether the food is secured by fair means or foul, whether it is stolen without being detected would be decided by the moral sentiments and intelligence of the individual. Instinct determines the 'what' aspect in the behaviour, intelligence the 'how' aspect, they are not contradictory but complementary to each other in their operation.

CLASSIFICATION OF INSTINCTS

Though we had acknowledged the principle of studying the nature of a mental state with reference to the physical manifestations, we are now faced with an unforeseen obstacle. The physical expressions in running may be induced by fear of aggression, or, it may be a part of the act of aggression. One would be the expression of aggressive instinct, the other of escape. In view of the fact that the same behaviour pattern is evinced by two different instincts a way must be found for discrimination. To overcome this difficulty McDougall has suggested that in order to identify an instinct we should judge the goal that is attained by the behaviour. "We must therefore define instinct by the nature of the goal, the type of situation, that it seeks or tends to bring about, as well as by the type of situation or object that brings it into activity".[3]

Even then it is somewhat difficult to ascertain exactly the number of the instincts. The main reason for this lack of unanimity arises out of the fact that man's actions unlike those of animals are the results of combination of unlearned responses and learned behaviour. Though born with the innate urges (which in the animals function in a more or less rigid fashion) man soon learns to make use of these in combination with other types of behaviour arising out of learning. Once the latter become habitual they resemble very much to the instinctive behaviour. The resultant actions are not easy to analyse or to isolate. Again, the growth and development of an instinctive behaviour is not altogether independent of the environmental conditions. Despite of their being hereditary modes of acting they depend a good deal on the opportunities available for their growth and maturity.

The long list of instincts drawn by Thorndike goes to show how difficult it is to avoid the pitfalls of conjecture. On the other extreme there are psychologists who hold that the instinct of self-preservation is the only true primary instinct, the rest are mere derivatives of this primary instinct.

The list of instincts prepared by McDougall is the one which has gained the widest popularity. These are: the parental (protective or racial instinct as is commonly known), instincts of combat and of curiosity, the food-seeking instinct, the instinct of repulsion and of escape, gregarious instinct, instincts of self-assertion and of submission, the mating instinct, acquisitive instinct, constructive instinct and the instinct of appeal. Apart from these thirteen major instincts McDougall would also like to include the minor instincts of scratching and laughter which though exhibit some of the instinctive characteristics fail to stand the test of all the criteria. With all their shortcomings it has to be admitted that McDougall has taken immense pains to justify the inclusion of each of these into the category of instinctive behaviour. Unlike Thorndike, McDougall has considered those behaviour patterns as instinctive which can be observed to attain a definite goal.

CRITICISM

However, in the light of our experience it is difficult to maintain that the criteria with which McDougall has judged the instinctive modes of responses are above criticism, or that the list he has drawn is thorough and comprehensive. Could we consider, for instance, laughter as an instinctive act? It is accepted that there is a definite urge behind this form of behaviour, that laughter when evoked may be without any tutoring, and that traces of this 'instinctive' expression could be found even among some of the animals like the higher apes. But what is the definite situation in which laughter might be expected to be aroused? This point is important in view of the fact that all the instincts have been linked with one particular type of situation or another. Is there any specific stimulus for laughter? An untutored child may laugh lustily on seeing a person slipping over a banana peel, but his education and upbringing could radically alter this tendency later on. He would then take pity upon the sufferer and even extend his helping hand and regret instead of laughing. Again, the emotion experienced in laughter may be caused without any physical expression as it happens in the appreciation of a genuine humour. On the other hand mechanical laughter may be induced in a person without any concomitant emotion behind it as is caused by inhaling laughing gas. Considering another instinct, it has been maintained that goal of the gregarious instinct is "merely the near presence of other members of the species; its impulse is to approach others, especially a group of others".[4] Yet the case of the wolf child presents a striking contrast. Two children reared by wolves in the jungles of Midnapore when were taken into captivity failed to show any positive response towards human contact even after continuous and persistent efforts made for a considerable period. They abhored the presence of human beings while expressing unambiguous preference for the company of wolves. Such exceptions provide grounds for considering the problems of instinct *de novo*.[5]

INSTINCT AND EDUCATION

As mentioned earlier an instinctive urge may give rise to varying modes of expression. Suddenly faced with a ferocious beast one person may run away, another may climb the nearest tree, a third while howling for his life may be stunned and rooted at the spot, whereas the fourth with a gun in his hands may face the charging animal calmly waiting it to approach within the range. Yet all these individuals have a similarity in their actions, viz., preservation of life. The varying reactions are the resultant effects of intelligence on the one hand and training on the other. The person who climbed the tree had two alternatives before him, viz., to run away, or to run up the tree. It is his sense of discernment which aided him to decide which path he was to follow. Anyway, he could not have succeeded in the performance had he not the previous training in climbing a tree. Likewise could be explained the actions of the man with the gun. So we see that full benefit of the instinctive urges could be derived only if the individual had received requisite education to modify his reactions. In the following have been summarized the educative values of instincts.

1. Instinct is a natural urge, a fund of energy is thus made available to be put into use of the individual and his society. Since education entails activity of the person, energy for this purpose is an important factor to be reckoned with. In the development of perception we had seen how a child endeavours to learn about something new while ignoring the object known to it. Energy in the former is provided by interest; without his positive efforts in no sphere of human life

knowledge could be attained. Instincts provide a ready fund of energy. If a child are born with the innate desire to construct, even if it were at an age long after birth, the teacher has only to use this urge properly so that improved forms of constructive ideas may later grow.

2. Instinctive urges are economical aids to learning. With regards to the safety of life, for example, the child needs only be taught why it should act in a certain manner, it can realize its necessity through the instinct of self-preservation (or, the instinct of escape as McDougall would like to call it). The child only required to be taught *how* to do it efficiently.
3. The fundamental principle in education lies in building up knowledge over the base which the individual has already acquired. That is to say, there are different stages in education each of which is suitable to a specific age. It is known that all the instincts do not appear simultaneously, that some succeed over others in their appearance. Equipped with proper knowledge regarding the time of appearance of each instinct it could be possible to take the fullest advantage for educational purposes. The herd instinct in the man remains at its height during the period covered by the stages in schooling. And we also know that the individual learns better and more swiftly when placed in a group of its own age than if he were to work in isolation. Combining these two facts it would not be very difficult to increase the output in the individual in his educative process. Another significant illustration is the instinct of curiosity. This natural teacher of all knowledge manifests its power in devious manners. And it is a well known fact that education could not possibly be thrust upon a retroactive mind. An efficient method of teaching lies in devising ways and means to make the most effective use of the natural curiosity in the educand which is evinced in different forms at different stages of growth.
4. In view of the fact that instincts cannot be repressed out of existence a teacher trained in psychology would never press for this outmoded method. The modern teacher is well aware of the fact that such an effort would only lead to grave consequences causing irreparable damage to the personality of the child. He

would endeavour instead to make use of the instincts or if necessary direct the urge through some other desirable channels. The instinct of combat and the allied emotions could be utilized for developing the competitive tendencies. The early awakening of the sexual tendencies could be harnessed for forming friendship, awakening the sense of æsthetics and learning elementary natural science. Channelizing the instinctive desires to accepted paths is known as *sublimation.*

5. A thorough knowledge of the instinctive tendencies would enable the teacher and the parents to know better of the child's mind, and refrain from doing injustice to the child. The instinct of self-assertion leads to the showing off in the child. By nature the child is incompetent, awkward, and weak and of these it is well aware. Consequently, it tries to derive satisfaction out of showing off now and then. It would be misunderstanding the situation if this tendency were confused with the socially undesirable traits of vanity and bragging of the adult.

REFERENCES

[1] McDougall, W.—*Outline of Psychology*, p. 110.

[2] *Ibid.*, p. 110.

[3] *Ibid.*, p. 119.

[4] *Ibid.*, p. 154.

[5] For a detailed consideration of the history of the concept of instinct, see Mitra, S.: Concept of Instinct, *Ind. Jr. Psy.* 1928, pp. 109-125.

CHAPTER VI

EMOTION AND EMOTIVE STATES

Emotion is one of those mental states which are usually given a back seat in our every day life. This is especially noticeable when emotion is compared with intellect. In referring to a person as emotional it is presumed that the speaker hinted at one of those qualities of which the less said it is the better. Yet our present day knowledge in psychology abounds with facts to show that emotion is one of those psychological phenomena which are essential for a smooth working of the individual and his society. In matters related to our daily life we are not so much concerned about one's learning or intelligence as his personality and ability to 'get on' with others, and both of these have their base in the emotional make up of the individual. It is but for the studies in psychoanalysis and psychiatry that our attitude towards the problems related to emotion would have remained where it was a century ago.

Emotion like most other psychological phenomena has its physical counterpart, and it is mainly through the studies in the physical expression that our knowledge regarding emotion is enriched. To start with, we may describe emotion as an unlearned behaviour pattern rich in the mental content and accompanied by overt or latent expressions.

Many might look askance at the emphasis being laid upon the behaviour quality in emotion. We are accustomed to hear poets and painters dilating upon their experience impregnated with the psychological aspects of emotion, the physical effects of emotion are seldom heard of. But then how do we learn about the intricacies experienced by these poets and artists? Is it not through their poems and canvasses that we gather about their mental states? Even a child learns to recognize in the voice of its dad just returning home from office whether it was an opportune moment to ask ,for a football or stay away in the background. Every emotion has its characteristic expressive behaviour pattern. Further, the emotions like instincts are unlearned. Emotion is one of the innate traits with which man is born. As a matter of fact instincts and emotions are complementary in their functioning.

In the last chapter we have seen that the instinctive urges have three aspects, viz., cognitive, conative and affective.

Emotions constitute the affective aspects. What is the intrinsic relationship between instinct and emotion?

Confronted with a particular situation calling for an instinct to function man acts in a predetermined manner. This *desire to act* in that manner and that manner alone signifies the character of the emotion in that case. It adds zeal to complete the task ahead. An approaching beast not only creates an urge in the person concerned to move away from the source of danger but fear hastens the reactions. Taking another illustration, if a situation may arouse the instinct of combat, anger or hatred, it would help the man to fight to the best of his abilities. Man uses up more energy under the stress and strain of emotion than when he is guided merely by thinking and reasoning. In fighting his enemy a patriotic soldier is driven to use up every ounce of his energy due to the intense pang of hatred for the enemy, he relies a little on the rational aspects of patriotism ; to produce similar reactions in an ordinary mercenary soldier he is supplied with alcohol since it is known that his urge for fighting is mostly derived from the financial gains that he envisages.

But it is not always that emotion facilitates instinctve urge, instead, the latter at times may be inhibited. Standing too closely near the enemy the victim may be stupified and stunned to inactivity. Pleasure arising out of understanding and comprehension in learning furthers the functions of the instinct of curiosity and the process of learning thereby is facilitated. On the other hand confronted with confusion and lack of comprehension of the situation causing annoyance leads to the inhibition of the same urge. What reasons might be ascribed to this differentiation in reactions against the same situation?

It is suggested that emotion is capable of facilitating the instinctive reactions only when opportunity for the organism to function is available. If the situation happened to be such as not to allow functioning of the instinctive propensity, the emotion ends in inhibiting the conative processes. For the man standing too close to the beast, the way to his escape is barred for all practical purposes, at any rate that is how he would feel, and in such a circumstance the emotion of fear is awakened, further retarding the urge to escape. If, on the other hand, there is any chance for escape the person sees a ray of hope in it and hope brings pleasure impelling the man to act. We can now see why constant hinderance causes frustration in the man and more so in the child.

CHARACTERISTICS OF EMOTION

1. We have already seen that the fundamental characteristic of emotion, is that it arises in conjunction with the instinctive urge facilitating or inhibiting the man's reactions in that situation.

2. Though it was stated in the earlier chapters that the method of introspection is an important guiding principle in studying psychology, it is now found that this process is of little avail in studying the phenomena related to emotions. As a matter of fact the more one tried to concentrate his attention to observe the emotion the more this mental state appears to dissolve. Perhaps that is why we are advised by the lay psychologists to count hundred in order to reduce the intensity of the emotion of anger. In practice what actually happens is that engaged in the act of counting the anger mounts up proportionately. Owing to this difficulty we are compelled to have recourse to the next method of study, and this, also, leads us to the third characteristic of emotion.

3. Each emotion bears its own pattern of physical expressions. It is this aspect of emotion which teaches a child—and even the animals—how to recognize the emotional character in a person at particular moment. The facial expressions together with the bodily movements under anger and pity are not the same, nor are the behaviour patterns in love and terror. It may not always be possible to locate any specific organ as the source of emotion or as the focus of the present emotional reactions but the *patterns* formed by the combination of movements of the limbs, voice, gait, ocular expressions, changes in the complexion, etc., giving out the condition of the emotive state can be well recognized. Each individual is aware of his mental conditions during excitement as also the physical expressions, and when he notices similar behaviour pattern in another person he interprets the underlying mental state. It should, however, be pointed out that the readings of the expressions may not always come true. For instance, by applying feeble electrical shock to the cheek muscles on one side of the face, facial expressions, which accompany enjoyment may be observed, and the same stimulus if were applied to both the cheeks simultaneously what would ensue would be mistaken as laughter. But the concomitant mental reaction of enjoyment in such cases would be absent; the same thing happens when laughing gas is inhaled.

Civilization, however, has robbed much of these characteristic expressions in emotion. A loud guffaw giving full vent to the feelings of mirth are now frowned upon and considered impolite just like the outbursts of anger. This condemnation arises most probably out of the desire to 'tame the beast inside the man', and educate his impulses. If this were true it is now clear that the efforts have gone in vain. Suppression of expressions is not synonymous with the repression of feelings. Checking the former would not necessarily alter the course of the latter. While contradicting the commonly held belief that the Briton possessed stubborn character because of his ability to stick out his chin at a danger, Bernard Shaw in his characteristic shavian manner had observed that emotion after all did not reside in one's chin! In the battle fields nowadays the soldiers do not give out the primitive battle cry but that did not mean that appropriate emotions in them were absent. So, the overt expressions are modifiable but not the latent feelings.

Apart from the observable bodily reactions, emotions also produce unnoticed internal changes. Put into a dangerous situation the heart begins to beat faster, the rate of respiration increases, salivary secretion is decreased, and so on.* To observe all these internal physical changes use of finer instruments is necessary. Anyway, these subtle manifestations remain outside the power of one's control and they too could considerably reveal the specific features in an emotional state.

It would not be out of place to add here a few words regarding the origin of these expressions. We owe it mainly to Darwin who had pointed out the close resemblance of the emotional expressions in man and the animal. Man gnashes his teeth, shrieks in rage and with bended head remains mute in grief just as do the lower primates. Emotion, it has been said, helps the instinct to function in its best manner, and these physical expressions merely strengthen the mental correlates. The angry cat in fluffing and arching its back intends to convey its potentialities to the maximum. In piteous and appealing situations behaviour of the dog is not very much different from those of the man, the expressions merely accentuate what was required in the emotion of appeal and self-submission. In other words, man has borne through the evolutional stages all those behaviour patterns which have their origin in the animals.

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* In the rural areas it is a common practice employed in detecting crime by requiring the suspects to chew dry grains of rice. The real criminal, it is believed, would choke himself in swallowing the chewed grains. Though not an infalliable measure it nevertheless employs rudiments of psychology. Scare and fear reduce the salivary secretion and the thief in chewing the grains would not be able to reduce them to a paste. But then the drawback here is that the rest of the suspects also may be scared!

With regards to the internal changes it could be stated that functionally they are not different from the external manifestations. In anger and fear when the organism is suddenly called upon to spend extra energy it is to be expected that the various organic parts would share the burden. The muscles of the body have now to work more, consequently the blood supply increases to meet the demands of supplying food to the exhausted muscles and remove the toxic substances produced during the exercising of the muscles, and so the heart beats faster. Since the blood supply is increased in the muscles, supply to other parts—as in the abdominal organs—is depleted for the time being with the result that they function at slower rate. In other words, all these organic changes, external and internal both, only help in augumenting the psychological functions of the emotion.

4. In our everyday life we can see how in anger one is apt to use arguments of which he would himself be embarrassed in his sober moments, and, as we all know love is blind. Emotion, then, can definitely be said to interfere judgment and reasoning.

5. It was Pavlov who had demonstrated for the first time that an artificial reaction can be substituted for the natural reactions to a stimulus. As a natural response to the food when it is placed before a hungry animal salivation is observed to increase. Sound of a ringing bell could not be expected to produce similar reactions. But if a bell were rung every time the food was brought before the animal and the whole procedure repeated several times a stage would be reached when ringing of the bell alone would be sufficient to cause the animal to salivate. Thus the natural reaction of salivation is transferred from the proper stimulus of food to the erstwhile indifferent stimulus of sound.

What Pavlov had shown in the case of animals, Watson demonstrated in the case of emotions in the human beings. An infant is not 'naturally' afraid of any harmless though grotesque object. But this object if were presented before the child and simultaneously a loud noise, for instance, of crashing an iron bar, were produced (and this noise gives rise to the genuine unlearned fear response) then a few repetitions of the performmance would cause the fear to be transferred to the innocuous object. It may then be concluded that an object or a situation by itself incapable of arousing an emotion may do so if its presence were accompanied by an object or a situation evoking emotion. That is how arithmetical sums could be made to produce palpitation in the heart of the pupil if the sums were invariably accompanied by shouts and threats from the teacher.

THEORIES OF EMOTION

1. The emotional expressions as stated in connexion with their origin have been handed down to the man through the stages of evolution. This biological explanation was first offered by Darwin. He called these behaviour patterns as "serviceable associated habits" meaning thereby that those physical manifestations of the affective conditions which were found by the organism to be of good use were retained during the course of evolution. Retaining the main trend of the argument McDougall has elaborated it further. He has tried to explain that there exists a system of heirarchy in our expressional system, there is an order to be found in these expressions. For example, those emotions which are useful for the survival of the man are accompanied by the most impressive reaction patterns. For instance, alarm and rage associated with the instincts of escape and combat are the two most important emotions in the life of man, and that is why they produce the most vehement forms of physical reactions. Emotions connected with the instinct of curiosity being comparatively less important though are not devoid of physical manifestations are not so impressive either. In heirarchical order the gregarious instinct is of the least importance for the survival process and so it has no specific neuro-muscular apparatus to serve as it is in the case of anger. Since the emotional reactions have some definite end in view, some purpose to serve, McDougall's may also be called the *teleological theory*.

2. Darwin or McDougall's views on emotion though bear scientific attitude do not differ radically from the common-sense point of view, that emotions precede conative actions. We run *because* we are scared, the tender emotions in the mother *lead* her to caress the child, and so on. But the theory propounded by James and Lange* stands altogether on a

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* Though William James's views were published (1884) separately and independently from Carl Lange's (1885) unanimity in their opinion and the proximity of the period of publications have led the theory to be known as James-Lange theory.

different plane. Briefly, the theory asserts that emotions do not propel us to conative actions, on the contrary it is the bodily reactions produced during the conative expessions which constitute the emotions. Faced with a perilous situation as the man runs away—and the origin of running away is not fear but reasoning, they maintain—there are produced internally certain organic reactions which we have already examined. These organic changes are the source of internally produced sensations. Combination of these sensations constitute the emotion that is felt. And here lies the weakest spot in the James-Lange theory; it fails to make any difference between sensation and emotion, whereas we are fully aware of the characteristic difference between the two. Further, there is no doubt that organic reactions constitute significant features in emotions but it has not been possible to find out uptil now with exactitude what combinations of these organic reactions are equivalent to or may be correlated with the immense varieties of our emotional patterns.

3. The behaviouristic theory as proposed by Watson and his colleagues seeks for the explanation of the emotions in the innate organic reactions more or less on the same lines as McDougall has tried to explain the instincts. Among the multitude of behaviour patterns man is born with three *primary emotional reactions,* viz., fear, rage and love; the last word denotes any tendency for liking or showing preference. Originally fear in the infant is expressed under certain limited number of specific situations, for example when its support is jerkily removed, or, due to intense and sudden noise. Rage is caused as the consequence of hampering the infant's movements or arresting its normal actions as would take place by withdrawing the milk bottle before the child had finished drinking. Love according to Watson is the innate response caused by the manipulation of certain erotogenic zones like the lips, cheeks, etc. Manipulation of these zones, the behaviourists maintain, produced pleasure just as contortions of the muscles in the stomach produced pain in hunger. With the development of the child it is put under varied situations in life and there arise occasions when the basic emotions in their varying shades are gradually conditioned with other stimuli which previously did not evoke any emotion. Thus are caused the host of secondary emotions in later life.

4. Yet there is another school of psychology, viz., the psychoanalytical school which sees in our emotional reactions responses having their source in the unconscious region of the

mind. The psychoanalytical school led by Freud, Jung, Jones, etc., are unanimous on the issue that mind is divisible into two parts, the unconscious and the conscious. The latter, according to them, possesses much more limited functions in comparison to the former which is the main storehouse of the energy behind our actions. Many of our infantile desires lie concealed there repressed by the conscious mind. The conscious part of the mind has to function in accordance with the prevailing codes of morality particularly in the sphere of sex. Since those infantile desires do not find a direct outlet they lie dormant in the unconscious region and endeavour to find ways out to satisfy themselves mostly through indirect channels. Emotions according to this theory are mostly caused when a desire is repressed or when it succeeded in emerging out in the conscious sphere of the mind.

Despite the commendable efforts on the part of the psychoanalysts and their offering us new ways in our outlook it has to be admitted that their views suffer from the greatest drawback of lacking in experimental verifications. Very little experimental work has been done to ascertain their statements based on inferences mostly from mythology and the abnormal mind than from facts which can be duplicated and observed in the laboratory conditions.

THE COMPLEX EMOTIVE PATTERNS

In the above we have discussed emotion as a psychological state characterized by the richness of its content which makes it an easily distinguishable phenomenon. There are, however, other mental states which though are akin to the emotions differ nevertheless in their being vague and diffused. Emotion, mood and temperament could in some ways be put in the same category since they pertain to the affective domain of the mind. From qualitative aspects emotion as an entity is recognizable without ambiguity, whereas, mood and temperament are rather evasive in appreciation. Again, the latter two tend to prolong and linger longer than pure emotion and are also more complex in nature.

MOOD

It has been described as 'an enduring but not permanent emotional attitude'. When we say in common parlance that a person is not in a mood to work we mean that he is not in proper frame of mind to work, he lacks the 'go' in employing himself consistently or seriously to any particular activity. The 'lack of mood' may be caused by the physical conditions or due to some mental disturbance. It would however be wiser to draw definite limits regarding the usage of this expression. Mood implies the shadow, 'reasonating echo' which invariably trails behind an emotional impulse. After an outburst of anger, for instance, the emotional make up in the person does not immediately return to the normal state, the general trend and feeling of anger persists for some time. In that mood of anger one may perhaps laugh at a joke but the sign of mirth is superficial, he would return to the more persistent mood soon after the laughter. The mother who has lost her child would for long remain immersed in grief with outbursts of sorrow and distress now and then. But time would rob the grief of its sharp edges, and later though the mother may give a hearty laugh at the antics of another child or enjoy a picture or an outing, these happy occasions would merely form gaps in her afflicted mood which could be distinguished from her previous phase of acute anguish. Mood is diluted emotional state affecting other mental states by its presence.

TEMPERAMENT

It may be defined as the general affective nature in a person resulting from his inherited traits and also derived from his acquired qualities.* As against emotion and mood, temperament is of more or less permanent nature and indicates what could be expected of him in a certain emotional situation. A person known for giving himself airs or for his self-assertiveness may successfully suppress his tendencies of self-aggrandizement once in a while but he could not be called a shy person by any means. A shy person would by nature avoid self-display and is devoid of expressing vanity ; bragging for him would be something of which he is temperamentally incapable. While discussing personality and character we would have further occasions to see how an individual's temperament takes shape.

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* *Temperament* should be distinguished from *temper*, the latter means a display of anger or an angry mood. A man of quiet temperament might once in a blue moon show his temper and would be astonished to reflect later upon his own behaviour. On the other hand a certain amount of resemblance with the word temperament may be revealed. A man of 'quick temper' or 'sour temper' means one who is prone to give vent to his feelings more readily than the average person.

SENTIMENT

An organized group of emotions woven round an object, idea, situation or action is called sentiment.* A worn out dog-eared copy of primer becomes an object of sentiment because it was once used by the grandpa and it may be unthinkable to destroy it. Its value is judged not from utilitarian motive but from the point of view of sentimental reactions that it evoked. The bespectacled aged person carefully lifts the precious looking object, an ordinary pen, gazes at it, and then puts it back with a deep sigh. It was the present that he had received from his wife on their first marriage anniversary who died long ago. This object for him is more valuable than the costliest pen in the market. The pen differs from the primer at least in one respect, it is used by the old man now and then whereas the primer is never of any use to the grandson. Nevertheless both have now acquired emotional properties. The feeling for the grandpa and the old lady have been partially transferred to the respective objects. By virtue of this transference could we call these instances as conditioning process?

When the possessor of the object, the primer or the pen, beholds the article he is not actually showering his love upon the object itself so much as on the memory of someone who was connected with the article; it serves as a bridge between the present owner and someone not in existence now. This clarity of consciousness is absent in a conditioned response which is more or less a mechanical process. But the difference between the two mental processes could be wider still. The pigeon-hole of the hostel room in which the student had once spent his days physically cramped and mentally damped and had desired nothing better than quitting at the first opportunity would be looked upon with the eyes of sentiment fifty years hence. The whole mental picture then would alter. The painful days spent in the hostel would be readily forgotten and the few hours of pleasure and fun that he had derived during his stay there would appear before his vision repeatedly. If it were a case of mere conditioning the ex-boarder would experience the recurrence of the old repugnance on entering the room. So we see, sentiment is transferred emotion in a sense but not belonging to the category of conditioned emotions.

Conditioning is a means, a psychological process. In the forming of a sentiment on the other hand it is the end result which is kept in view, an end with social, moral or ethical values attached to it. Consequently it has to depend upon training. But this training may or may not accompany consciousness of the process in the person. Imparting of training in patriotism involves awareness in the educand, whereas the sentiment of self-regard grows out of its own accord. The grandpa had left no directions in his will to take care of his primer nor had the wife for the pen. The respective feelings nevertheless had taken their root in the mind of the persons concerned.

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* It should be distinguished from the word sentimentality which means exuberance of display of sentiments or the affective states related to the tender emotions.

Sentiment can be equally aroused around an abstract idea. Virtue is an illustration of this category. It is admitted that an abstract idea before it crystallizes must have a foothold in a concrete object or a situation which can be grasped through perception. It is from concrete situations that abstract ideas are derived. The child learns to disciminate between the actual acts of virtue and vice and then slowly grows in him the relevant sentiment.

EMOTION AND EDUCATION

It is rather curious that emotions though play dominant role in the development of our civilization had until lately received scanty attention. It could hardly be denied that it is primarily emotion, as an affective urge, which is responsible for the birth and spread of religious gospels, expression of artistic aspirations and the progress in science. A scientist rises by his intellectual merits but starts initially with his intense *desire* to probe into the unknown. The pivot of artistic creations and of religious devotion stand on emotional urges. And in these matters it is not the crude forms of emotions but the refined ramifications of love and likes which are the sources of noble creative urges. It was intense passion unceasingly burning within which drove Laplace and Newton, Curie and Pasteur to achieve success where mere depth of intellect would have met with frustrations arising out of the unsurmountable obstacles. Humanity could not have survived had not a Christ or a Buddha in his days striven forward with the passionate zeal behind their faith and belief ; a character of Arjun is a rare exception. Gœthe, Shakespeare and Tagore were giants in intellect because they could express brilliantly those superfine emotions which are denied to the mediocre.

Despite such facts in abundance the present day civilization appears to give preference to the negation of emotions. This is more remarkable in the development of anglo-saxon civilization. The Weimar days in Germany and the Victorian era in England had witnessed the climax of the repression of one's feelings and emotions. Success in matters of repression was considered as a hall-mark of a gentleman. The contagion spread to India with the advent of the British rule.

Reasons for such a strange attitude may perhaps be found in the confusion usually made between the natural emotional expressions and their excesses. Sentiment is civilized man's cherished possession, but sentimentality is the sign of an immature mind. The former is a healthy and socially desirable outgrowth of the primary emotion of love, which directs our energy towards social progress. Sentimentality is apt to be blind and lead us to the blind alleys. The magnetic appeal of Gandhiji, for instance, in eschewing sectarianism as in communalism had solely relied upon the noble sentiment of love for humanity. But it was not an uncommon sight to see during those exasperating days in the late forties, people filing past him just to have a glimpse of that magnanimous personality and bestowing reverence at his feet and a shortwhile later, taking active part in propagating communal hatred. This is sentimentality, a kind of temporary abnormality.

A normal mind is a balanced mind, a balance between what is experienced by the head and felt by the heart so to say. To think and reason on the bases of the intellectual wealth accumulated in the course of the progress of our civilization and yet not to ignore the stirrings of the natural emotional cravings is the characteristic of normalcy. Anger by itself is something undesirable which calls for control, but not to feel the just wrath when one's hearth and home are attacked is cowardice. Love is one single emotion which has contributed an immense share in building the present civilization but to show one's love at the cost of honesty and justice is a sentimentality no less harmful than needless arousal of animal passion. Maintenance of this balance, however, is only possible through educative guidance. Many a case of incorrect upbringing in an adult could be traced to the faulty training of the emotions in their childhood. And this is bound to be if we failed to remember that the developmental process in the man is a continuity.

The values of emotion in the man are becoming increasingly felt at least among the psychologists with the changes in the human relationship as demanded by the present social structure. It should be borne in mind that the industrial revolution in the west has not left untouched the ways and manners of living among the people of the east, and as it stands today there is hardly any likelihood of our going back to the old days. In the age preceding the industrial revolution a peasant was free to till the soil and lead a more or less segregated life. The social interconnections bore loose ties. He reaped his harvest with the age old implements and taught his children exactly as his forefathers were taught centuries ago. It was during ceremonial or some special occasions that he came into contact with his people of the broader group, and on such occasions he wore formal clothes and bore fomal manners. But the life of an individual today is inextricably mixed with the life of others. Factories and offices, ships and locomotives are run by social groups. The school is more than a place for mere acquirement of knowledge of an individual. Introduction of the mechanical means in agriculture is changing the life of the agrarian people too, and here also he has to work in a group. And the output in group work can be satisfactorily maintained provided the members in the group functioned harmoniously. This harmony is very much dependent upon the outlook of the individuals, their behaviour inside the group, and above all, their balanced emotional states. While the army is in action, an arrant coward may thoroughly upset the charge of a platoon. A spiteful mean person may ruin the machinary in the factory just to cause trouble to another person against whom he had a grudge. The young lad neglected at home would try to draw attention of others in the school with his pranks and in doing so destroy discipline. A tyrant teacher unawares may ruin the future of a nervous child by making him more nervous and permanently too. The pupils, young and old alike, would have less respect for law and order and discipline if they observe, and they seldom fail to observe, the elders encouraging them to break the elementary codes of moral discipline during the periods of election. And to expect these boys and girls growing as healthy citizens with respect for law and order would be something beyond psychological expectations. It may now be imagined how the loose fibres of feeling and emotion intertwine and become taut ropes of personality and temperament, the so called 'nature' of the individual.

We may now note the specific mechanism in the emotional development. Knowledge of these mechanisms would enable the teacher to do his task, even under the restricted circumstances that he is put in, from the station of his profession and also as a member of the society.

1. *Emotion a correlative to instinctive urges*—In order to study emotion we had to consider it in isolation, but in human life it does not exist as such. Emotion is experienced as an adjunct to the instinctive urges. It is with the success or failure of an instinctive urge that one feels the presence of an emotional state. A clear appreciation of this simple fact should deter the parents and relatives from acting in a manner which may cause the outburst of undesirable and avoidable emotions. The same action on being repeated would tend to make the young child more easily susceptible to such emotions in future. It is a matter of common observation that the elder brother or sister delights in teasing a baby by snatching away the toy or scaring it with violent rocking. Such actions not only leave an imprint of anger or fear in the child's mind—harmful by themselves—but also tend to make the child easily reactive in the future and show less resistance to such situations. And emotive states as we have seen not only react upon the vital functions of the body, as on digestion and sleep, but also affect other mental conditions.

2. *Emotions are modifiable*—Freedom is not synonymous with anarchy. As a matter of fact self-imposed inhibitions are the products of civilization and they help in building the civilization. The difference between repression and inhibition lies in the method of understanding. The parents may use repressive measures against the child's inclination to go and play outside instead of repeating the dreary arithmetical tables, but if the child sees for itself the meaning in the relationship of the numericals arranged in the table it may inhibit its desires to go out. It would restrain itself if it knew the reason and felt the need. It is this kind of inhibition which should hold it in its later years from committing a social crime instead of being driven by the fear of the consequences. Fear, like the proverbial forbidden fruit, has its own attractions, besides, the person may commit the crime as soon as he realized the possibilities of being undetected.

Conditioning is yet another process of modification. The young pupil could be made to learn his lessons of his own accord if the instinct of curiosity were properly exploited and the competitive spirit, an offshoot of self-assertive instinct, were inculcated. On the other hand, success in learning could be made a condition for receiving prizes and gifts. In the latter case the process of learning would be conditioned with material gain. Both these cases illustrate the effects of pleasure evoking situations but the former is much more desirable a process than the latter.

Emotions, then, are modifiable, and this much we learn from the *science* of psychology. As to how an individual situation should be tackled it depends upon the knowledge of the *art* of teaching.

It may not sound pessimistic to strike a note of warning here. It is now widely acknowledged that repressions have their baneful effects. This knowledge by itself would not, however, remove the defects in our training. Let it be frankly admitted that parents and teachers do not always possess that amount of patience which is prerequisite to teaching in any form, and, also, that they are not sufficiently equipped in every case to teach the inadept and the immature. These two factors combine to encourage them in taking the path of least difficulty that lies in repressions and punishments.

3. *Emotion has its maturity*—Though the infant is born with the three primary emotions, the number of the secondary emotions is numerous indeed. In enumerating these Sandiford has taken pains to collect most of the words, numbering about twenty-five, which depict the varied emotional states in the man though the list could not be said to be conclusive.[1] And, a glance at the section of 'Affection' in the Roget's Thesaurus would make one feel that such a list would always remain inconclusive. Emotions of revenge, scorn, suspicion, jealousy, for instance, arise from hatred. But to experience these the individual has to pass through the exact situations or else these would remain merely mysterious words. Life in this respect provides with the best schooling. The emotion of lust must wait for the advent of puberty and adolescence, while those of regret and cordiality are the outcomes of living in a polite society, and boredom is one feeling which appears to be the privilege of the educated people since the primitive men and the young children seldom allow any one to bore them!* An extra zeal in the teacher or the parents should not lead them to expect an emotion for which the child has not reached the requisite maturity, physically and/or mentally.

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* Unable to withstand the persistent demand of my son (4½ years) for a story just when I had finished all my preparations for a delicious noon day nap, reluctantly I started dragging one out of my story bag. The erstwhile wriggling body on the bed soon turned into a motionless creature devouring every word that I drawled. But I had hardly spoken for a minute and a half when the cherub blurted out that he had heard that one before, and since I did not appear to know a better one I could as well go to sleep!

[1] *Educational Psychology*—Sandiford, Peter, (1929), p. 137.

CHAPTER VII

PLAY

It is comparatively recently that playways in the child became a subject for psychological investigations, and child's play ceased to be looked upon as mere 'child's play' but an act which had some purpose to serve and to be considered as an aid to the educative principles. Play activity can be observed among the children of all lands and even among the young animals like the pups and calves this tendency is quite apparent. The appearance of play acts in the human life at least is a matter of certainty, and this had led some psychologists like Karl Groos to view it as an instinctive manifestation. For a time, as it was to be expected, the playways came to be looked upon as the saviour of the pedagogue in his solving almost all the problems in child rearing. With time, amateur's enthusiasm when had waned play took its rightful place in the psychological studies. Henceforth, pronouncements made regarding play in its diverse aspects were accompanied with facts which could be verified.

ANALYSIS OF PLAY

(1) *Curiosity*

Play is a conative functioning of the mind, resulting from the inherent curiosity in the child. The period of passivity in the infant amidst the surrounding "big blooming buzzing confusion" now being over it starts in its career as an explorer. Perception opens for it the gateways to knowledge, and whatever came within its range the child now endeavours to grasp and examine it with the scientist's curiosity in it. This is the beginning of the play activities. When it has held the object in every possible manner, seen it from every possible angle and perceived it with the aid of all the sense organs it proceeds to enquire about its dynamic qualities—how far would the object go, for instance, if it were thrown or just pushed, did it rebound or stay where it was when thrown, and so on. There is no planning behind these small acts but the child is always ready to learn from what it perceived. His interest, however, is not the same as in the adult, it could not be. For instance, the man on the horse back might not draw greater attention in the child than the movements of the horse, and the act of whipping the animal would perhaps hold his total attention and interest ignoring the rest of the things to be noticed.

(2) *Imitation*

The desire to observe on being partially satisfied the child next turns its attention to imitate the object observed. After it has seen the man riding the horse it would return home and imitate the action it had witnessed. As in the observation so in its imitations due proportion is not maintained in the different aspects of the object observed. A small piece of wood may be considered good enough to be a substitute for the horse while greater emphasis may be laid on the size of the whip. It imitates more which interests it; and of course, its imitation would be in proportion to the level of its physical and mental maturity that it has reached.

(3) *Repetition*

Repetitive action is the basis of all learning. Repetition strengthens the neuronic bonds between the brain on the one hand and the sensory and motor organs on the other. An act often repeated becomes not only easier for it to perform but, also, prepares it to perform more difficult tasks. It is exactly for this reason that drill finds an important place in effective teaching. However, the child would repeat only to that extent which would bring mastery in it. Once it had learned to do it, it would automatically take less and lesser interest in that activity.

Again, repetition is the easiest channel for self-assertment. Repetition produces the joy of mastery. So it repeats the rhyme it had lately learnt and with pride it would recite it before others over and over again.

There are certain types of activity which may contain one aspect of play or another and yet may vary extensively from playways. It necessitates distinguishing play activities from such actions.

PLAY AND WORK

A child may concentrate all its energy and play for hours together with a worn out shoe brush imagining it a horse now and engine afterwards. Only when its curiosity is thoroughly satisfied that it would leave it without hesitation.

If, however, the same child was made to play during certain fixed hours in the day with the rigidity of class room discipline it would soon begin to react towards play like a boy forcibly sent to school. Another child would play with water for what may appear to be interminable period but it would become work for it if it were asked to bathe itself. *Spontaneity* and *freedom* are the two essential requirements in play to distinguish it from work. The same activity would turn into work if there were any trace of compulsion in it. "Play," Goodenough has aptly defined, "is just a name that we give to activity when it seems to be particularly spontaneous, initiated and controlled by the impulses of the moment rather than by the vision of some more remote goal."[1] Furthermore, "Play is not set off from work by any hard and fast line, but one merges into another."[2] That the child's play activities are not devoid of any goal we shall have occasions to see later, but the child itself is not aware of it, nor does it seem to be desirous to know.

PLAY AND GAMES

Play activity when is taken up by a group instead of an individual is called game. But it is not the number of persons involved which is of importance but the social aspect in the activity. In a game the participants have to maintain certain codes and principles agreed upon by the participants. A few boys may play with a ball but it becomes a game when the laws of football are introduced even if in a rudimentary manner. Like play game too may adopt the character of work when the factor of compulsion is introduced in it. It is a game of tennis for those who intend to relax after the day's toil, but for the national champion or the professional player it is work, since the game for him would have the same function as going to the office to others.

PLAY AND AMUSEMENT

It has already been witnessed that activity in play is an important factor, so is its absence in amusement. Amusement is characterized by the comparative passivity among the participants. When the father gives company to the child who is engaged in play the former does not take similar part as another child in his place might have done ; yet, he may like to "play with" the child after his office hours, and afterwards he might be heard to remark, "I was amused . . . "

FORMS OF PLAYWAYS

Among the different forms of play that of *make-believe* is the commonest of all during the earlier stages. The child places itself in the position of another person and enacts the latter's role. As an engine driver it is not content with the imaginary functions of the driver, but, believes that it itself is the engine driver. This is not a mere act of imitation, or a case of intense belief, but something more. This way it releases its pent up emotions. It is not satisfied to remain a child but wants to grow big, perhaps to enjoy the seemingly advantages of the adult life, and that is why it wanted to be a driver. It wants itself to be admired, as it admired the prowess in others, and who could possess more strength than the man behind the gigantic locomotive? It would enact the role of any one it admired or believed others admiring. So, it would be a driver one day, a lion tamer after witnessing a circus performance, and a teacher on another occasion if it had observed a teacher being respected by his pupils. Thus the child satisfies its instinct of self-assertion. The girl, likewise enjoys being mother to her doll and satisfies her parental instinct. Both the girl and boy would enjoy building mud-houses and satiate their instinct of construction, curiosity and gregariousness. Satisfaction of an instinctive urge and desire by the way of catharsis is a great purpose served by the play activities.

Fantasy is another form of play in the child as also among the adults. If make-believe depended on action fantasy can be created in thinking. As in dreams so in fantasy the child satisfies such desires which may not find fulfilment in reality. As a matter of fact more a child was debarred from experiencing realities through actions in life situations the more would it depend on make-believe plays. And if the ways for make-believe were closed to the child it would have recourse to the weaving of fantasy. It is for this reason that the fairy stories are so popular among the children in the relaxing mood. The child's imaginary companions, talking to whom the child takes delight, form only another type of play. Imaginative character of play in fantasy remains the same.

THEORIES OF PLAY

(*a*) Aristotle, the Greek philosopher, held that play helped in mental relief by releasing the pent-up emotions and feelings. On the basis of the present day knowledge it may be said that those instincts as of combat, repulsion or self-assertion, which are mostly held in abeyance in the civilized life, find not undesirable outlets in mock fighting. In play, according to Aristotle, the mind is, so to say, purged of its pugnacious feelings and desired balance is brought about for maintaining normalcy. Therefore this theory is known as *cathartic theory*. The word catharsis means in psychology the relief from abnormal excitement gained by releasing it.

(*b*) Herbert Spencer has argued that play is the expression of surplus energy. In the adults much energy is consumed in the efforts for our survival. The tremendous amount of energy that we have to spend in order to equip ourselves with the knowledge for earning our living, and later on, when we enter into our professional life leaves little redundant energy. In the child this aspect of life is looked after by the parents. Consequently, an abundant supply of energy is ready at hand which is utilized in the play activities. But this surplus energy is not spent haphazardly. The forms of play methods which are adopted during the different stages of the child's growth are innumerable ; but, there are definite patterns too to be noticed in their playways which could not be accounted for in Spencer's theory.

(*c*) Karl Groos on the other hand believed in the existence of a higher order of actions in play. He reminds us that the play activities are manifested only among the higher animals. In comparison to the lower animals the higher ones live a more complicated, as also, longer life. Their needs and demands are much greater and varied in nature. They must learn to adapt themselves into the circumstances in the future unforeseen as yet. In play they anticipate the future activities of their adulthood and prepare themselves accordingly. In mock-fighting for example the child learns to defend itself in the imaginary acts for its survival. It is a matter of common observation that those animals which possess greater amount of intelligence take longer time to attain maturity. This intervening period is devoted to the acquirement of natural skill, and play provides with those situations which help in the improvement of this skill. Thus, play according to Gross is *teleological*, that is, its manifestation and development are guided by the purpose and design served by it.

(*d*) Stanley Hall views play from a diametrically opposite standpoint. Play according to Hall, is reminiscent rather than anticipatory. In biology there is a school of thought which sees in the development of an individual all the phases through which mankind has evolved from the lowest of the organism. Wriggling of the infant is compared to the motions of the fish, its creeping on the belly is compared to the movements of the reptile, as the child takes to walking on its fours it resembles very much indeed to a quadruped, and, toddling it appears to imitate the ape. A growing individual thus recapitulates the stages through which his ancestors have passed. In play acts Hall sees the recapitulation of certain activities of the animals in their various stages of evolution. Stated in brief this theory could be expressed as—ontogeny repeating phylogeny.

CRITICAL REVIEW

The various theories of play have been regarded by some as complementary rather than contradictory. To accept Aristotle's theory of catharsis, Spencer's theory of surplus energy has to be assumed. Because, only that part of energy, mental energy included, could create tension in the individual which was not used up through the usual channels of human activities.

Again, the cathartic theory may be regarded as an extension of Hall's theory of reminiscence. The emotions which are purged in play are those which are closely related to the instincts, the assets of the primitive man for his survival. Reminiscent play, as conceived by Hall, is a mode of discharging the instinctive urges in a rather profitable manner which otherwise would have met with repression giving rise to undesirable consequences. Thus by way of catharsis in play man retains the balance of the mind.

On the other hand, the views of Hall and Groos can be approached with conciliation. It may not be difficult to envisage the play activities as recapitulatory as well as anticipatory. In play it is not only that the feelings and actions of the remote past are repeated but the child also prepares itself for the future. Play forms the intermediary link between what the child as it was and as it would be in the future.

But there could also be made adverse criticism against these theories and neither would it be unjustified. Spencer's theory of surplus energy, for instance, fails to explain how we can play even when we are tired. Fatigue is evidently the outcome of excessive expenditure of energy whereas play requires further expenditure. What is the source of this apparently inexhaustible energy? Some have attempted to explain it on the basis of instinctive urges. Confronted with the problem as to how a person could play tennis so energetically after a tiresome day in the office, Ross puts forward the explanation that through this game the person may relieve his combative disposition. He has said, "Instincts may be regarded as stores of psychological energy that can be tapped when the energy derived from less well-established sources is on the point of failure".[3] This is almost a conjecture. We would have then to believe that man's capacity to work is inexhaustible. Besides, he has not made any distinction between fatigue as we understand by the word and boredom. The person emerging from the office might not be tired so much as bored. Under that condition diversion in any form preferred by the individual would increase his output again.

A teacher, however, would do better to consider all the four basic theories as complementary to each other. Broadly speaking, all these theories appear to have some contribution to make towards a fuller explanation of play activities awaiting the future.

PLAY AND EDUCATION

If play were accepted as a biological functioning, it would cease to be looked upon in that playful manner which people are wont to. As a matter of fact it was our ignorance regarding the nature of play which led us to accept it bemusedly with studied tolerance, and scornfully at times. Naturally, the question of looking at it as a means of education hardly arose.

The theories of play which we have examined above though do not encompass every aspect of play, and despite the fact that none of these by itself could offer a comprehensive explanation, we have to admit that they have at least succeeded in compelling us to give more attention to the play activities. Truly, no educationist today could fail to take notice of the abundant facilities that the playways offer for educative purposes. A few illustrations may not be out of place here.

As we are aware, the infant needs adequate physical exercise for the development of its organs and their co-ordination. In the absence of any 'natural' impulse to play it would be difficult to visualize how this could have been attained. Like a self-propelled machine the baby looks after its own development. Herein lies the most important contribution of play. It is through playways that the child takes active interest in learning to perceive the innumerable objects lying around, and on correct perception grows the knowledge. Again, playing with others the boy learns how to adjust himself in the midst of others and this is the genesis of social consciousness. In matters of formal teaching a boy would learn to count and read, write and recite more enthusiastically, and efficiently if these were carried in a playful spirit instead of in the atmosphere of compulsion inside the classroom. Play could be used as the medium for teaching democracy and self-government. In brief, the playway is the modern spirit of education. In all the modern methods of education, Dalton Plan, Project Method or the Heuristic Method play activities hold an integral part in one form or another. Teaching no more emphasizes upon the subject matter alone but centres round the educand, this Adams has called the 'paedocentric' tendency in education, i.e., looking at the whole process of education principally from the point of view of the child.

It is presumed that such modern methods will remain free from the interference from the outmoded authoritative systems. The place of a teacher in such a system will be that of an advisor. Froebel and Montessori were quick to observe the contrast in the behaviour of the child in play and its reluctance against the use of any kind of force. The same child would change its retroactive attitude in an environment offering freedom. By nature it takes immense pleasure in discovering the world for itself and taking its due place in it. It detests all the ideals and aims in education which we preach when these are thrust upon it against its wishes, and loves and regards all that it learns by discovering for itself. This principle of allowing the child to learn by itself is known as the Heuristic principle in education. History could be more profitably taught with the aid of stories correlated with the actual experiences of the child. Geography the child discovers and learns in open air experience better than inside the classroom. Discipline it takes to liking because it is self-imposed in play and not conditioned with fear and hatred. Such factual evidences being in abundance we could hardly afford to ignore the playways or fail to make their fullest use as means of education.

REFERENCES

[1] Goodenough, F.—*Developmental Psychology*, p. 217.

[2] *Ibid*

[3] Ross, J.—*Groundwork of Educational Psychology*, p. 106.

CHAPTER VIII

IMAGERY AND IMAGINATION

IMAGE

It is rather curious that in our everyday life we miss many a mental phenomenon which if were closely observed would offer a wealth of information regarding our mental life. Image is one such phenomenon. Hardly a day passes when we do not make use of image in one form or another, but few would have the patience to take notice of the same. Reflexion of the sun, for instance, paralyses our vision for a short while but we very often fail to notice the white coloured circular disc—image of the sun—dancing in the darkness that now lies before our eyes. *Image* thus could be defined as a revised vision of the sense experience in the absence of the stimulus which had originally produced the experience. If we fixed our vision on a lighted electric lamp for a minute or so and then suddenly closed our eyes we would see a flash of light for a very brief period. Introspection if properly carried would reveal a close resemblance of this light with the source of light which was actually watched. In other words, the sense experience originally evoked by the lamp persisted for a while before it disappeared. Image being a rather general term we could specify the kinds of image, stated in the illustrations, as *after-image* since their appearance is followed by the stimulus. In view of the fact that the image in each of the illustrations here, is very much like the stimulus itself such an image is known as *positive after-image*.

If we did not loose patience after gazing at the lighted lamp and cared to keep the eyes closed for a while we could see an exact replica of the light but of altogether different colour appearing and disappearing at regular intervals. A similar phenomenon could be observed if we stared at a piece of brightly coloured paper for a minute or so and then shifted the gaze on any white surface. A reproduction of the stimulus complete in its contour would now be observed but the colour would be of different variety. If the stimulus colour was of rich red the after-image would be green, and if the paper was coloured bright yellow the image would be of bluish hue. Since the colour of the after-image does not follow the quality of the stimulus colour such an image is called *negative after-image*.

An after-image can also be noticed in the other domains of sense experience. After the music had stopped, strain of the last cord does not die out suddenly, it lingers for some time though growing feeble in intensity. The dust particle even after its removal from the eye leaves behind the uncomfortable tactual image.

IMAGERY

It is a collective term to denote images produced in all the sense organs. So, while we could use the expressions visual images, auditory images, etc., the word imagery would refer to the images as a class different from any other mental phenomenon.

PERCEPTION OF MOVEMENT

The imagery help a good deal in explaining the phenomena of movement and continuity in perception. Let us examine as to what happens in the course of projection of the shadows of a film on a screen. The strip of film showing several pictures of a man in the various postures in the act of running when screened would transfer the shadows on the screen. Each of the negatives differs from the preceding or the succeeding ones almost indistinguishably discernible only when observed closely against some sort of reference. The individual pictures, in the Figure 12, could be distinguished from each other only when they were compared against the dotted lines of reference drawn across them. As we watch the film in action each negative produces a separate perception of the pictorial representation of a perception. Now, exposure of the negatives ought to have resulted in the jerky reproduction of the isolated pictures of a man each varying from the other. This would actually happen if the speed of the exposure were greatly reduced. But we should remember that each picture not only

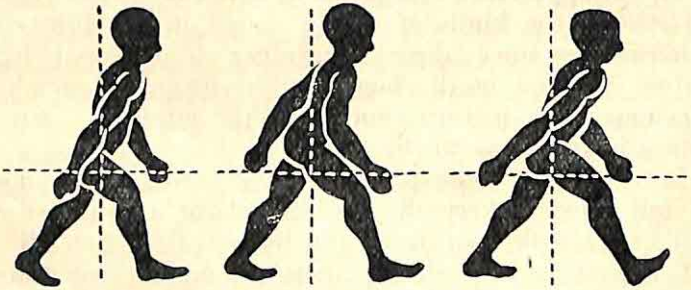

FIGURE 12.

produced visual perception but, also, left behind a positive after-image in its place when the stimulus was removed. And, before this image has had time to be obliterated the next picture causes its own sense impression. These two get fused on the retinal surface. What results is:

Not sense impression of (*a*) → gap → s.i. of (*b*) → gap . .
But sense impression of (*a*) → image of (*a*) + s.i. of (*b*) → image of (*b*) + s.i. of (*c*) . . . .

and thus is caused in the mind an illusion of movement in the film. An illusory movement thus produced is known as *phi-phenomenon*. This phenomenon is also experienced in other sensory fields. For instance, while playing piano the player produces a rapid succession of notes but these cohere in the mind to evoke the sense of continuity and what we hear is a continuous tune and not a series of notes.

CLASSIFICATION

Classification of imagery usually is based on the functioning sense organs. An image is known by the sense organ in which the image is caused. Thus these would be known as visual image, auditory image, tactual image etc., etc. But imagery may also be classified according to the nature of their origin, viz., *objective* and *subjective*. The after-images belong to the former category because the images here are closely related to the objects. Whereas, those cases of imagery in which the object is placed far away from the imagery in the temporal field are called subjective imagery. *Eidetic* and *hypnogogic* images belong to this class. Eidetic images are very common among the children but rarely found among the adults. The image of an object or a scene in the case of eidetic image may often persist in all its details for a long time after the object has been removed away. The child can visualize an object in greater details and more acutely than an adult. The images in the eidetic imagery are at times so sharp that the child confuses between the image and the real object. In such a case the image though is far removed from the object in time has its source in it. But in the hypnogogic imagery which are produced just preceding deep sleep, resulting sometimes in the fantastic images of falling from a great height or drowning in the sea are purely subjective in nature. How then to distinguish such subjective images from hallucinations? The latter term is reserved for those cases where the person insists that his experience is based on actual experience of the object and not on the images. In the eidetic and hypnogogic imagery the person experiencing them could be persuaded to see through the error of his judgment but not in hallucinations.

IMAGINATION

The imagery which we have discussed in the above, belonged to the class in which the time interval between the sense perception and the formation of the respective image is comparatively brief. In contrast, imagery could also be experienced by recalling the events which had happened in the rather remote past. Efforts in the recollection, for instance, of the hill which one had climbed when young may result in the clear cut visual images which should be properly called *memory images*. As the name implies these images are stored in the mind and we bring them to our consciousness when required.

When the memory images are mentally combined together by way of synthesis and something new is constructed out of these, the act is called *imagination*. Evidently then, the ability to imagine would depend to a large extent on the actual experience of the individual. By mixing the images of gold and mountain together it is not difficult to imagine golden mountain in the fairy stories. But, barring in exceptional cases, it would be extremely onorous to imagine a goat with three legs and five horns, likewise would be the problem of imagining air or space.

In imagination, then, imagery form an essential attribute ; images of past events are restored so that the person experiences the sense impression actually not in existence. Secondly, the imagery are now put to some definite use, the act of imagination is a means with some end in view whereas the formation of imagery is the means as also the end. It may be added here that imagination though is a constructive act is not necessarily creative, the difference between these two words should be clearly understood.

The poetic fancy, the prophet's vision and the inventor's imagination are psychologically not different from each other. They all make use of their capacity to retain the impressions of the past events and objects, and recall them in their vividness as and when required. They cause modifications in these imagery like a potter handling clay and out comes something new which did not exist before. Presumedly, the results would not be forthcoming if the person did not make definite efforts to construct his imagination. Even in the day-dreaming a minimum amount of effort is necessary. The third distinguishing feature in imagination then is this conative aspect.

CLASSIFICATION

Imagination is a mental process, it is a way of looking which no eyes could see. But one sees through imagination what he wanted to see. It is this aspect of imagination which determines its nature and kind.

When an artist visualizes the effects of the colour combination he intended to use in his picture, when a dramatist ponders over the suitability of the character still unborn in his play, an engineer tries to weigh in his mind the effect of his blueprint after it was put into production, they all endeavour to employ their power of imagination to a constructive end. They might as well have finished their work and seen the effect in their reality, but they prefer to visualize the effect beforehand. These are the illustrations of *constructive imagination.*

It is a common misconception widely prevalent that constructive imagination is a flair of the genius, that it descends upon a few who were endowed with the blessings of some supernatural power. Facts, however, go to indicate that construction imagination develops in any person who possessed three qualities not out of the reach of an average person. Constructive imagination demands clarity of the mental imagery, capacity to hold them before the mind and visualize them in their modified state. Eventually all these would require a thorough grasp of the subject matter. However, we have yet to learn whether the first of these three prerequisites could be improved by training, but the last two certainly offer scope for improvement in any normal person of average merit. Inventor's inventions or the writer's *opus* is not necessarily the result of sudden brain waves. Murphy has brought forward convincing arguments to show that a thorough grasp of the subject in this respect is the most essential factor to be reckoned with.[1] It is presumed that a man's grasp of the subject will be in proportion to his interest in the subject as also his intellectual acumen with which he was born.

Imagination, again, may be used in conjunction with feelings and emotions. The doctor may treat his patient with all sincerity of purpose and yet lack in any definite feelings towards the patient's sufferings. He may administer the drug and wait to see the effects as a chemist would wait to observe the reactions taking place in the chemicals in his test tube. It does not mean thereby that the doctor acted mechanically. He surely anticipated the possible effects but this he would do objectively. If the patient were a child and the mother administered the medicine she would also expect some sort of result to ensue but would do so with an amount of sympathy which did not accompany the doctor's ways of looking at the whole thing. It is this closer contact existing between the sympathiser and the sufferer which gives rise to *sympathetic imagination.* In sympathetic imagination one placed himself in the position of the other person and envisaged perhaps more than what was natural. This type of imagination could be distinguished from creative imagination by its lacking in objectivity; sympathetic imagination tends to overweigh the situation. Judging from this point of view it could be called unrealistic.

Again, the act of imagination could be directed solely towards the fulfilment of one's wishes which he was unable to fulfil immediately or in the near future. It is this sort of *'Utopian' imagination** which comes to the aid of the child in his attaining the unattainable, offers millennium to the fanatic, and to the lazy his celestial pleasure. But it also brings hope where hope there is little, fortitude in distress and solace when needed, without which many a man would have died before his death.

CHILD'S AND ADULT'S IMAGINATION

Judging superficially the word imagination would appear to convey an impression of absolute unreality, something which never had any existence and may not have, but this is not correct. We have seen in the above that it is not possible to imagine something of which one never possessed any knowledge in the past. This statement is applicable to the case of the child and the adult both. This too we have seen that combination of a host of images was necessary for imagination to occur. But an adult takes *probability* into account in his imagination, while this question does not arise in the young child. In the latter the probability of a lion sleeping under the bed is as high as rain never ceasing from falling. It may be argued that sometimes man too imagines the presence of ghosts. If, however, such a person was not inclined to see through the facts and arguments to the contrary placed before him, he could surely be considered as not having reached mental maturity, at any rate in this particular respect. Anyway, with the child's development he comes into contact with realities and with the growth of his knowledge and reasoning power he gradually draws reins to his flying fancy.

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* Utopia, an imaginary island is described by Sir Thomas More in his book with this caption, where there exists perfect social conditions and no suffering in any form.

PLACE OF IMAGERY AND IMAGINATION IN EDUCATION

The ultimate source of all knowledge is direct perception. But this experience would be of little value unless the memory images were retained in the mind and brought out when needed. Such need arises in the act of imagining, and imagination fulfils the task in the absence of the actual experience of the situation. Imagery, then, are of great consequence in the economy of time and experience.

Imagery again play an important part in the concept formation. The imagery of various objects cohere in the mind and ultimately form the concept of the class of objects or of its abstract qualities. As Rusk has pointed out, "The greater the pupil's stock of imagery, the longer he employs it, the better and sharper will be his later concepts".[2]

At the elementary stage the pupil will have to make extensive use of imagery in reading, writing, counting and in all other subjects. For discriminating correctly between 3 and 8, or between 6 and 9 in writing, or in reading such complicated alphabets as জ্ঞ or ক্ষ, in recalling the multiplication table or in doing sums in mental arithmetic, and even at later stages when map drawing demands correct reproduction of the object seen, the pupil will have to draw heavily from this mental imagery. But with his mental development the child should be weaned out of the habit of relying on imagery, or else, it would create impediments against the progress in learning. If he was to take constant help of the imagery in writing the speed would remain retarded, likewise his mastery of subjects like algebra and appreciation of literature would suffer much.

We should, however, be aware of the limitations in forming imagery and in imagining. It is absurd to expect of a pupil in class four or five to mentally magnify an orange a million times over in order to visualize the shape of the earth! It may be wondered if any person could correctly, or even approximately, imagine the magnitude of 'million times'. Again, demonstration is an aid to comprehension in such matters, but this process of comprehension does not grow abruptly or in an unlimited manner. In order to explain the process of rain formation, for instance, it would be advisable to demonstrate in the class how water vapour condensed when it came into contact with cold surface. This experience the child would no doubt make use of in the future. It does not follow thereby that we should expect the pupil to understand the process of rain formation immediately after the demonstration. For one thing, he would find it extremely hard to see any link between the small amount of water vapour coming out of the boiling kettle and the huge clouds that he had witnessed ; the case would be worse still if the child had neither seen a sea, nor even a suitable pictorial representation of the sea. For another, he has no experience of high altitude and less of the fact that the temperature at high altitude is low. So we see, imagination has its own limits.

Judging the value of imagery and imagination it may be asked whether these abilities in the pupil could be improved upon by training. Briefly, imagery formation may respond to training but imagination would not. Imagination is a constructive activity and such an ability is related to the individual's general intellectual capacity. A boy could be trained to visualize an object or a picture as it was ; repetition, efforts and attention may help him in this respect. But, to visualize it with one or more of its qualities altered—as it would be required in imagining—or trying to 'see' the other side of the object lying beyond the visual field, it would depend on some other mental capacity besides perceptual. And, to combine the imagery and visualize the resultant effects would require intellectual capacity of higher order.

Arguments have often been advanced in favour of encouraging children in matters of imagination, as also, against this practice. In order to adapt the children to the realities of life Montessori once had objected against the prevailing practice of telling fairy stories. This way, she believed, the child would shun to face the realities and take lessons from the actual experiences preferring the life of imagination, and may indulge in reveries instead. But lack of imaginative capacity is not tantamount to developed sense of reality. Besides, this argument would no doubt hold good if the person took to day-dreaming rather too often. But there is hardly any one who has not relished the values of fancies and fantasies as means of escape in situations exasperating. It is inevitable in the case of boys and girls of tender age who cherished great desires and possessed limited aptitudes to translate their wishes into practice. In other words, it is not day-dreaming which is harmful but when it is carried to the excess. What is desirable in building a healthy mind is a balanced blend of cravings in the mind and sustained efforts to put these into effect. Sympathy, for instance, is the outcome of imagining oneself placed in the place of the sufferer, and the fairy stories offer plenty of situations wherein the listener imbibes this great quality which is the proud possession of human civilization. It should, however, be remembered that in the absence of any encouragement and active practice in helping the distressed, intensity of sympathy in the individual would gradually diminish.

Again, it has been suggested that vivid imagination tends to induce the person against facing facts bearing unhappy consequences. 'Cowards die thousand times in their life' because they visualize the danger too vividly and this retards their action, "An uncontrolled vivid imagination sometimes makes people cowards in practical affairs."[3] But one may ask, which of the two factors is responsible in producing cowards: the vivid imagination in the person, or his lack of training in matters of action in a situation evoking danger? The mental qualities like cowardice or bravery are certainly not innate traits.

In describing imagination Dewey has stated, "Clear insight into the remote, the absent, the obscure, is its aim."[4] It is evidently the means, the ends have to be decided upon by the teachers and parents. Vivid imagination in the child could make it see ghosts and goblins in the dark, or, when older end in building castles in the air. On the contrary a similar aptitude has aided in the production of Alice in the Wonderland and in the construction of steam engine. What text books could rouse the enthusiasm to study history which the boy would experience in his imagination while gazing at the Qutub Minār or while wandering on the walks of the Red Fort?

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[2] Rusk, R.—*Experimental Education*, p. 110.
[3] Sturt, M. and Oakden, E. C.—*Modern Psychology & Education*, p. 202.
[4] Dewey, J. P.—*How to Think*, p. 291.

CHAPTER IX

HABIT AND MEMORY

The expressions memory, habit, learning, power of retention and the kindred terms have been used so indiscriminately that a student of psychology comes to believe that one of these is as good as any other. But words are pictures of ideas, and these words would not have come into existence had they not borne different ideas. To a student of education it is all the more necessary to have a clear grasp of these expressions because it is quite often that these words are carelessly used without any heed to their specific significance.

Learning of a subject does not always entail its comprehension, learning might take place without understanding. One may learn to draw better and yet remain unable to explain how he did it. Learning to draw and to write mostly concerns coordination of the functions of the joints and muscles of the fingers and the hand. Similarly, a child as it grows is hardly conscious of the fact that it *learns* in matters of cleanliness or feeding and dressing itself. In matters of feeding, for instance, it learns how to sit in a certain manner, place the plate before it and hold the spoon, etc. ; then certain improvements are introduced, that is, it modifies its basic habits and practises upon the newer habits till they are mastered, and thus proceeds learning. By habit formation we mean the ability of doing a work more efficiently than one had initially started with.

Rote memory may be considered as a kind of habit formation. There is no intrinsic difference between the abilities in the holding of a spoon at three years, or memorizing a poem in a foreign language at six, and either of these performances could be compared with a parrot's repeating "What a dud you are!" The only difference is that in the first illustration the motor skill that is involved is in the domain of the limbs and in the last two cases skill is required in the vocal apparatus. Sheer efforts could succeed in a child to repeat the multiplication table but no amount of mere habit formation could induce it to add 2 and 3.

Learning then entails understanding and/or habit formation of the motor activities of various kinds. In psychology memory is considered as a form of habit. In matters educational this habit is of psychological nature rather than purely physical as required in holding the pen.

ANALYSIS OF MEMORY

Memory as a psychological entity consists of three different states. Firstly, the matter has to be 'committed to memory' as we popularly use this expression. This is not purely a cognitive action but has the conative counterpart as well ; it is difficult to say which plays a more dominant role. Secondly, memory has its characteristic retentive aspect. In committing to memory the person tries to retain the subject matter. In this respect conation has undoubtedly an upper hand since the person makes definite efforts to retain in his mind what he has learnt in order to use it in future. Now, a young pupil after he has struggled with the poem for an hour may experience a tinge of pleasure in believing that he had 'done it' and later feel complacent about his success. When, however, he tries to recall it he may find himself hopelessly stuck at a line here or a phrase there. Under the circumstances the teacher would conclude, and justifiably too, that the pupil had failed to memorize the poem. Recalling, then, is the third feature of memory. If, however, someone recited the poem the pupil would easily recognize the missing words, a few more repetitions and his memory of the poem would be complete.

It may be asked whether recognition of the idea could be substituted for recall. A simple experiment would convince that recognition and recall though are psychological processes belonging to the domain of memory are nevertheless its two different aspects. Below is described a simple experiment to conform this statement.

Exp. Prepare a set of ten nonsense-syllables* and write them down on a card. Tell the person, on whom the experiment is intended to be performed (to be referred to as Subject) that the card when shown to him he should read the syllables carefully and try to remember them. When the cards have been exposed for sufficient time ask the Subject to write down all the syllables which he could recall. The total number of correct answers would indicate his capacity for *recalling*. Next, produce before the Subject a set of cards bearing the ten syllables shown earlier along with another set of ten syllables not shown. Assumedly these twenty sylllables should not be presented in an orderly fashion but should be mixed. The S should now be required to point out those syllables which he could recognize as having been shown before. The number of correct answers in this case would show the S's power for *recognizing*.

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* If two persons were asked to memorize a poem and a story and then to reproduce these the result would not be a reliable indicator of their capacity for memorizing. It is quite possible that one would possess greater liking for poetry and the other for prose, the former therefore would memorize more of the poem than of the latter, and in the case of the story the result would be reversed. Again, in one of these persons the story may bring in his mind an actual event bearing close similarity to the narrative, and consequently he would memorize it quicker and retain the substance longer than the other person. Psychologists therefore are obliged to take help of some device which when used as the material for memorization would have the same effect on all persons. Ebbinghaus' nonsense-syllables came to the rescue. Construction of these consists of sandwiching a vowel with two consonants taking care that the syllable did not possess any meaning. THE is a word but TEH or HET is a nonsense-syllable. Two or more persons when are subjected to memorization of such syllables and when asked to reproduce them would reveal in their comparative output the individual capapcity for memorization and the result would be reliable.

Some interesting results would be obtained from the experiments of this nature. Firstly, the number of materials recognized would be found larger than what could actually be recalled, proving thereby that recognition is an easier process than recalling. These two processes, then, could not be considered the same, or else, the same syllables in the second experiment would have been recognized which the S had recalled after the first part of the experiment. Secondly, chances of confusion in recognition may be greater than in recalling. For instance, the syllables TEH and MUX may be erroneously recalled as TEM and MUN. But the chances of 'recognizing' TEH and MUX as TEM and MUN would be larger in the second attempt. Strictly speaking, recognition could not be given equal status with recall, the latter alone should be the best and direct proof of memory. Ability to recognize but not to be able to recall is a sign of immature memorization. Further strengthening of such weak links would make memorization perfect. For all practical purposes in education, however, it has become customary to bracket the power of recall or recognition as the third factor in memory.

CLASSIFICATION

We owe it to Bergson for the classification of the mental functions which go by the name of memory. Weaning out his views from hair-splitting philosophical speculations we arrive at two kinds of memory described by him. His distinction takes into consideration the forms as well as the content of memory. Much of what happened yesterday may be retained in content though the details of the events may not be possible to recount. It may be difficult, for instance. to repeat *ad verbatim* all that my friend had said in answer to my query put to him yesterday though the purport and the trend of his conversation could be retained mentally for a long time. Memory of this kind Bergson called *pure memory*. On the other hand, when a boy recited a poem line by line without the least idea of what he was reciting the act in essence was not much different from that of the dog's habitually carrying its master's newspaper to his room every morning. What the boy had achieved was merely a language habit and the dog succeeding in developing motor habits. Intention behind rote memory is to form mere associative bonds between the different words with the aid of sound. This is *habit* memory.

RELATIVE MERITS

Memory has its own place in learning and it could not be discarded from the process of learning, and yet, in its employment there could not be a single formula. In the past, greater emphasis was laid on memorization, because memory was considered synonymous with the learning process. This was mainly due to the lack of understanding the nature of memory. The practice today is to advocate for its use in those subjects which have already been understood. If the educand has followed the sequence in history, or in learning a poem if he has followed the gist it would be then easier for him to remember the content even after a fewer repetitions. Not only time would thus be saved but, also, he would be able to retain it longer. The prerequisite for this type of memorization is comprehension of the *meaning* of the matter presented. If fear may goad one to memorize with the habit memory, proper presentation of the material exposing the meaningful aspect will help him in learning quicker with less painful experience, and remember longer.

On the other hand, there are subjects in which rote memory, or habit memory as we may say now, plays an unavoidable part. Principles behind the compilation of arithmetic table may be explained to the pupils, but remembering the table is not possible with the aid of comprehension alone. Here we have to fall back upon the powers of rote memory. Likewise, in memorizing the rules of grammar, or in spelling, habit memory could not be dispensed with. It is in the teaching of such subjects that we feel the drawbacks of what is called the direct method.

Though it might have been of interest to describe here how the different types of memory could be profitably employed in the learning process we may defer this topic till a later opportunity arrives. Instead, we would discuss here some of the characteristic features in memory not stated before.

MEMORY TYPES

When a teacher insists upon verbal teaching without taking any help of the black-board, he presumes that his words would have the same effect upon all the ears. It is perhaps difficult to conceive for an average teacher that there might be students in the class who could retain the subject matter much more effectively had they seen some of the important points written on the board. The fact that similar stimulus could produce dissimilar results if different methods of presentation were adopted could be verified from the following experiment.

Exp. Prepare three series of non-syllables each containing equal number of syllables. These will be referred to as the series A, B, and C. Select a number of Subjects for the experiment. Use the materials prepared in the following manner.

Stage 1. Present the materials in the series A visually. The S should be instructed to read each syllable in the list silently, i.e., he should not use his vocal organs while reading. Complete silence could be obtained if the S kept his tongue touched to the roof of the mouth and the lips were kept closed in order to avoid any sub-vocal speech. When all the syllables were seen the S should reproduce the syllables in writing. It is presumed that he would be unable to recall all the syllables he had read. So, the materials should be exposed all over again after which the S would have to write them again. This whole process should be repeated till the S proved capable of transcribing the nonsense-syllables without any error. The number of required exposure for correct memorization should be noted down.

Stage 4. Using the same S this time the materials in the series B should be presented auditorily. Each syllable should be audibly and distinctly read out by the Experimenter to which the S should listen with his eyes closed without repeating the syllables. After the whole series had been recounted the S should write them down. The process of listening and writing down should be continued till the first correct reproduction was possible. The number of repetitions required should be noted.

Stage 3. Contrary to the previous stages, the S should now be asked to read for himself each syllable in the the third list of nonsense syllables. Thus he would see them himself while reading and listen to his own voice. The number of attempts required for the first correct reproduction of the list is to be noted.

This whole series of experiments if were repeated on the same S some interesting observations could be made. Possibly he would require lesser number of repetitions in the series A than in B, but the possibilities are greater that he would require the least number of repetitions in the stage 3. Another S may, however, feel quite at home in memorizing while he passively listened to what was read out to him than when he read himself; the number of such Subjects would be found to be comparatively small. Using the results of a large number of Subjects it could be generalized that people remember better when they received the impressions visually than auditorily and, presented audio-visually along with the motor organs of speech functioning the materials can be memorized with the least number of efforts. Psychologically the stimulus bears greater impression in the last case due to the fact that two sense organs (the eyes and the ears) simultaneously carried the impression to the brain. From this point of view the old method of reading aloud can be well justified. The best method of memorizing meaningful materials would consist in reading the matter aloud and then reciting it to find out how much could actually be recalled. If gaps in memory were detected the process should be repeated. It is presumed that this procedure in rote memory would be followed only after the subject matter had been properly explained to the pupil.

Those persons who can employ the visual method with the maximum benefit are technically known as *visiles*. *Audiles* are the class of persons who rely for memorization mostly on the auditory stimulus. Those who feel compelled to use motor movements—as in speaking—are called *motiles*, and this is the most common type.

The experimental procedure described in the above opens up another field of enquiry. The teacher in his class teaching is often confronted with the problem of evaluating memory among the individual pupils. In the absence of any suitable and reliable device in objectively testing memory his opinion becomes biased and is akin to conjectures. That individuals vary in their capacity in memorizing may be demonstrated and their ability in this direction quantitatively estimated in the following manner.

Exp. Suppose a number of pupils were sent to you for testing their ability to memorize. You may start with the first pupil using a set of nonsense syllables. Expose the syllables in the series one by one and when all of these have been shown ask the S to reproduce the materials. The number of correct responses would be the scores for his *memory span,* that is, the number would show his ability to remember when the materials were seen for once. The memory span of the other Subjects could be accordingly determined and compared. Use of the nonsense syllables though is a standard procedure in psychology it may be mentioned here that there is a tendency for the memory span to vary according to the nature of the materials used. It would therefore be advisable to use some other kinds of materials as well, e.g., words, sentences, numbers, pictures or concrete objects. The memory span in the Subject then could be considered as the average of the scores obtained using the various types of materials. The average score in each of these pupils would then indicate his relative position in the group making it possible for evaluating the individual's capacity for memorizing.

OBLIVISCENCE AND REMINISCENCE

In memory the mind shows its characteristic nature of possessing diametrically opposite tendencies. In memorization we are mostly concerned with the aspect of *remembering* and are apt to ignore the aspect of *forgetting* considering the latter as mere negation of remembering. Biologically, however, both have their due role in the life of an individual. Ballard reminds us that "As obliviscence is a gradual process of deterioration in the capacity to revive past experiences so is reminiscence a gradual process of improvement in that capacity."[1] If reminiscence has its positive value in the life of the organism no less has obliviscence. Mind possesses a limited capacity in its functioning. The unaccountable number of experiences in our life could not possibly be retained ; for the sake of economy the nonessential parts of our experience must be shed out. Of this we have plenty of illustrations in the class room situations. History is taught in details all of which are relevant to the main topic chosen, but the pupil is not expected to retain in his mind all the details in the form. Out of the host of narratives his mind selects only those salient points which may act like the spans of the bridge of his association.

In future when the pupil would try to recall what he had learnt these broad facts would emerge out in his mind minus the details. Is it then necessary, it may be asked, to teach in details, to expand the form? May not the teacher give only the broad facts and save his pupils from the 'unnecessary' strain in listening to more than what he would actually remember? Experimental evidence goes to show that the summary of lessons is retained in the mind in proportion to the details of the original narration. Dangers arising out of the slick "notes" and the deceptive "easy lessons" can now be only guessed:

MEMORY AND INHIBITION

If a force obstructs, partially or wholly, another force from its operating, the former's function is called inhibitory; if the former helps the latter it is called facilitatory. By striking the ball already in motion the bat performs facilitating act; the same bat would be playing inhibitory role if it were placed in front of the oncoming ball. In the realm of the mind too these terms are applicable. The efforts to memorize or to recall may be facilitated or inhibited by other mental functions. All the unpleasant emotions like fear, hatred, repulsion, etc., produce negativating effects on memory, particularly fear. 'Stage fright' is the most common of this kind of inihibition. Presence in the class room of a tyrant teacher causes inhibition in memorization. Threats of punishment and shouts are no remedies against faltering memory but are its worst foes.

The other type of inhibition, *retroactive inhibition* as it is called, is a common feature we come across in memorization. If a pupil has spent an hour in memorizing rules of grammar and soon after he was pressed for studying history—requiring him to remember dates, names, and events—his learning of grammar would be hampered. If he tries now to recall the rules in grammar he would do it less successfully than if he were allowed sufficient pause before taking up history lessons. The conative efforts necessary in reproducing historical facts would greatly nullify the associative links formed during learning grammar, that is to say, the former had caused retroactive inhibition in the pupil's learning grammar.

IMPROVEMENT OF MEMORY

The caption of the topic gives a fair indication that there exists certain possibilities in the improvement of memory.

But surely there is no "quick system" or "easy method"—the evils of commercial advertisement proclaiming sometimes—to produce spectacular results. Memory like all other mental processes demands in its functioning certain favourable conditions; if these conditions were properly fulfilled memory may be expected to improve within its framework of limitations. The following may be considered as aids to memory though not techniques of increasing it.

(*i*) That which impresses the learner as interesting is retained longer; so improvement in the teaching method for creating interest in the pupil is in itself a 'short cut' to improvement in memorizing.

(*ii*) Need is the greatest of all incentives in learning. The will to learn is in proportion to the need that the child may feel, and as Burt has aptly pointed out 'the will to learn is half the battle'.

(*iii*) After each attempt the learner should be given some rest before proceeding with a fresh task. Mind needs consolidation of what it has achieved. The tired mind like the sandy soil is no ground for fresh growth.

(*iv*) Each learning process should be followed by efforts to recount; thereby, the learner can see for himself the weak spots requiring reinforcement.

(*v*) Above all, it is the determined attack made unceasingly which breaks through all fortress, including ignorance.

REFERENCE

[1] Ballard, P.—*Obliviscence and Reminiscence*, pg. 17.

CHAPTER X

ATTENTION & INTEREST

WHAT IS ATTENTION?

If in the lower elementary stage the teacher may have to coax and cajole his pupils and draw their attention with fairy stories, the sergeant-major in the army believes in the sheer bellowing of 'Attention' for attaining the same results. Psychologically, both the teacher of the primary stage and the sergeant-major believe that passive listening is not enough for comprehension and that it is essential to secure the aid of the mental process we call attention. We find that this phenomenon in its action is also observable among the animals though, perhaps, in a crude form. The cattle while grazing in the field could be noticed constantly wagging ears. The slightest sound of an uncanny nature coming from any direction would be caught by the ears which otherwise might not have been perceived had the animals possessed fixed ears like those in the man. Likewise, the chameleon engaged in pursuing its victim constantly roves its eye-balls and the primary concern in the animal though is to catch flies its attention could be readily directed if something more important entered in the visual field.

Closer observation would reveal some interesting features running through all the illustrations in the above. Firstly, that attention is not a mental phenomenon by itself like perception or emotion, but it is a *process*, as Stout has maintained, *a process directed towards a clearer cognition of the objects.* This perhaps is the best description of attention to meet with our requirements. We cup our ears while listening to a voice growing faint against the wind, and strain our eyes to see something not clearly visible. These are our methods of receiving the most of the stimuli provided for our auditory or visual perception. These processes are in no way different from those of the animals described above.

Secondly, the process of attention is intimately related to what is known as interest. The teacher very frequently confuses between the issues of attention and interest. While complaining to the guardian of the pupil that the latter lacked in interest what the teacher wanted to convey is that the boy did not attend as was required ; well, if the pupil failed to show the interest that the teacher desired some of the blame may fall on the inadequate method of teaching as well!

Thirdly, attention is proportionately related to interest. The teacher despite his capability to arouse interest in the class would fail to maintain the standard if the pupils awaited a 'friendly match' soon after the class was over. Likewise, the grazing cattle would not show equal interest to sound of chopping wood in the forest and the roar of a tiger. The chameleon could afford to ignore the innocent looking lad wandering nearby provided he did not evince any attention of causing harm to the little animal.

WHY WE ATTEND?

It is perhaps fair to surmise that attention is caused in the face of arising instinctive interest. Let us reconsider the previous illustrations in the light of this statement. The pupil's attention flagged because his instinct of curiosity could not be kept sufficiently aroused. The worn out method of teaching history, for instance, causes the lesson mostly to fall into deaf ears perhaps because of the pupil failing to find any link between the major events in the reigns of the successive monarchs. The historical events are like the separate pieces in a jig-saw puzzle which only on being coherently put together could create a meaning and arouse interest. The dead chronicles would grow alive if the pupil could see the interrelationship amongst the events of the past and those happening in his everyday life, curiosity will then be enhanced.

As we go down the scale of evolution these instincts become limited in scope and centre mostly around the life-preservative tendencies. To the animals, mostly guided by the instinctive urges and actions, only those things are of any interest which govern their self-preservation and continuity of the race. Consequently, they tend to attend readily to those incidents which aid in their self and race preservation.

Instinct, as described by McDougall, is an innate urge which is aroused when an object or a situation is *properly perceived*, that is, when *attention is paid towards it*. If the object or the situation were ignored due to the lack of sufficient attention the urge may not arise nor the conative drives related to those urges. The instinct of pugnacity or the combative instinct in the young lad is aroused only when the words of his rival are taken seriously. Lack of attention would lead to the failure in grasping the intentions of his 'enemy'.

It often happens even among the adults that the sarcastic remarks of one who is disliked are not immediately taken into cognizance. Later on more attention when paid to the words causes clearer apprehension of the remarks and leads to the changes in his attitude.

But then this grasp is not altogether independent of the intellectual level of the person. A sarcastic rebuff may fail to go home if the individual aimed at is incapable of understanding the subtlity inherent in the sarcasm. Similarly, the feeble-minded child is intellectually incapable of seeing through the relationship between the oncoming vehicle and its own existence at stake, and so it pays scant or no attention to it. It required Newton's intelligence to see through the very subtle relationship between a falling object and the earth's gravity, which fact was not attended to by the billions of other human beings. It should be made clear that intellect determines only the extent of attention that we could expect from its possessor, the actual process of attending would be initiated by the interest. Lack of persistence or concentrated attention is a characteristic feature among the feeble-minded and the backward children. Nevertheless, a minimum degree of attention could be extracted from them provided interest were aroused.

WAYS OF ATTENDING

It is beyond our scope or capacity to improve the intellectual ability in a person or his instinctive urges related to the process of attention. Yet, the place of attention in education is too well known. We should better see what suitable means could be devised to keep this process in operation. Our first task would be to inquire in how many ways attention could be possible.

The illustrations provided at the outset of this chapter if were analyzed further we could discern certain prominent differences. In all these cases the end is the same, viz., enhancement and focussing of the perceptual process, but the means of achieving this end varies. In the case of the chameleon, for instance, the passing boy would not arouse any attention, but any surreptitious movement on his part would be instantaneously noticed, just as we may feel compelled to look at the erstwhile clear sky if we heard a thunderclap. The attentive process is so to say forced upon the individual. This is what is known as *non-volitional attention.** Whereas in the case of the inattentive pupil the class teacher would be satisfied if the student could by some means retain his attention to the subject matter. A joke from the teacher might draw attention of the pupil, but soon after his mind would probably lapse into the inattentive phase. It may be said that the teacher desired *volitional* attention from the student.

Both of these types of attention may closely follow each other, or pass from one type to another without disturbing the continuity in the attentive process. Engrossed in reading an absorbing story the reader's attention may be jerked to the source of sudden pain caused by anti-bite. Attention in reading is of non-volitional type since the easily comprehensible language together with the captivating content kept the reader's attention continuously drawn towards the reading matter, and it remained so till the ant bit. It now changes over from the reading matter to the worm; at this stage if the person attempted to revert his attention to the book he would inevitably experience some difficulty. His attention would tend to wander away towards the ant-bitten spot on the skin. The reader would now have to divert his attention forcibly—which had enjoyed a free flow uptil now—to the reading matter. The attentive process which was non-volitional till now would become volitional.

What are the educational implications of the different types of attention? By iself, learning is not invariably a pleasure evoking process, it is the end attained which causes pleasure. If the process of teaching could induce satisfaction to the pupil he could be expected to offer volitional attention, and this certainly is the ideal condition in the class room. After all, it is the effort made in learning which is of paramount importance for the achievement of success. But this ideal state could not always be expected in actual class situations and less so among the younger pupils. Here lies the important function of the teacher in creating interest in the pupils despite their lacking any particular zeal for learning. In other words, we would no doubt desire volitional attention from the pupils but at the initial stage we have to put up with the non-volitional type of attention inherent in them.

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* Volition is "the act of deciding upon a course of action and initiating it', therefore, a volitional act results from the sustained will of the individual in which his conative effort is essential. Non-volitional act, on the contrary, would be that which is the outcome of spontaneity. In common parlance such an act may be called 'voluntary' (in the sense of voluntary service). But psychology while borrowing the common expressions from our everyday life reserves the right to use them in technical sense. Voluntary action has been defined as 'activity which is preceded by the idea and desire of accomplishing a certain result'. We see, then, there is no material difference between the expressions volitional and voluntary, and we propose to adhere to this convenient procedure. In describing attention it would be safer to avoid the terms voluntary and non-voluntary, if however it becomes necessary to use them these should be considered synonymous with the words volitional and non-volitional respectively.

It is admitted that there exists certain ambiguity in the expressions non-volitional and involuntary or non-voluntary. Both the meanings 'enforced' and 'spontaneous' appear to be inherent in these terms. Let us see if we may discriminate these in their usage.

A sudden loud noise outside the class room would enforce the students' attention towards its source. Similarly, in order to divert the attention of a crying baby when the rattle is whirled to produce sound it is the enforced non-volitional attention which is aimed at. The individual here cannot help attending; but, as it may be expected, attention arising out of such a situation could not be sustained for long; so, its use in the class room is out of question.

On the contrary, when a teacher opens the class with a story which has some bearing on the day's lesson, or to start with when he revises the lesson of the previous day he intends to draw the spontaneous non-volitional attention from the students. The pupils, unlike the crying baby, assemble in the class with certain aim, they are partially conscious of the fact that their attention would be demanded for the purpose of learning. But, for the method of teaching to be considered as suitable the aim of the teacher should be to employ the minimum amount of energy from the pupils. By revising the lesson of yesterday the teacher was placing something before the pupils which they could recognize as known to them, and thus it helped in preparing the foundation of the lessons for today which was unknown. A story, a demonstration, a revision would bring out the spontaneous attention from the pupils, and certainly it is more economical than if this pupils had to struggle right from the start of the class in their comprehension. For using such rational conception pedagogy has been considered a scientific subject. But teaching is also an art. The teacher must plan beforehand how much of this he would devote to the introductory part, how he shall link up the story with the lesson in view, and when.

As the teacher enters a new domain of the subject the pupils gradually make volitional efforts for understanding it.

Of this fact they are not quite conscious, and he is a skilful teacher indeed who does not let his audience feel they were now making efforts to understand.

Evidently then, the teacher should aim at making use of volitional attention which arises out of and is followed by enforced and then spontaneous forms of non-volitional attention. That is what Stout meant in his statement: 'the final aim of the teacher ought to be to convert voluntary into spontaneous non-voluntary attention'. Learning will not be possible if it has to be based on non-volitional attention alone.

We may now see that the so-called types of attention should be rightly considered as stages in attention and not really kinds of attention. Learning demands conation and cognition, and these undoubtedly result from attentive process, but it would be futile to demand attention (voluntary attention) from an infant, a baby or a child, and yet they do learn. This would not be possible unless they themselves volunteered to attend, for reasons we shall see in this chapter. Nevertheless, once this involuntary attention had been evoked there is every possibility of voluntary attention to follow provided it were not seriously handicapped.

CHARACTERISTICS OF ATTENTION

Attentive process is distinguished by the three broad characteristics, viz., its continuity, fluctuations, and limited scope. The specific features in these characteristics are their variability from one individual to another, so much so that these characteristics have been abundantly used in experimentally studying the individual differences.

(*a*) *Continuity in Attention*

It is commonly observed that left in a passive state mind tends to wander. More precisely, images and ideas fleet by in a continuous stream and the attention keeps on deflecting from one object to another. The world appears to be in a state of flux. As soon as we choose to attend an object in particular we lift it, so to say, from its background and our attenion is concentrated on this object. This object usurps the *focus* of our attention while all the other ideas and objects remain at the *margin* of attention. Then suddenly the object is removed from the focus and is amalgamated with the margin and something else next occupies the focus. The whole process may be diagrammatically represented as in the Fig. 13. We may call the object to be at the focus of attention when it is at x. It is at this juncture that the perception of the object is most acute. Before reaching this stage the object may be said to remain at the marginal area. In class teaching the teacher very often endeavours to retain his pupil's attention constantly at the maximum but we have to see if this is possible.

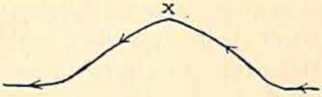

FIGURE 13
DIAGRAMMATIC REPRESENTATION OF THE STREAM OF CONSCIOUSNESS IN ATTENTION. THE MAXIMUM ATTENTION IS REPRESENTED BY THE LOCATION 'X'.

(*b*) *Fluctuation of Attention*

Looking at the centre of the Figure 14 it would be noticed that despite best efforts the figure changed its shape from time to time. This is due to the fact that it can be analyzed into more than one component figure, and during its alteration attention is captured by one or the other component. Using any other figure which may not be ambiguous like the present one our attentive process would continue to fluctuate but may fail to be noticed for the singular character of the material used.

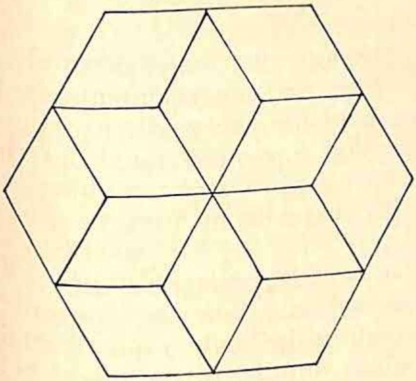

FIGURE 14
AN AMBIGUOUS FIGURE.
Look at the centre. Does the pattern change?

The minimum period during which attention could be held at a stretch is known as the *duration* of attention. It is probable that the duration in an individual could be increased by practice though to a very limited extent.

Often it is asked whether it is possible to attend simultaneously to more than one object. Examples are frequently cited about Napoleon who, it is alleged, could attend to several matters at a time. The writer has noticed similar abilities in a physician in this country. This personage can keep himself engaged in telephonic conversation while holding the receiver pressed between the neck and the shoulder, examine his patient with stethoscope held in his left hand, write prescription for another patient, and also converse with the person across the table. What actually happens in such cases* is that the person changes his focus of attention constantly and rapidly from one object to another without loosing the link. In persons of average merit the line of demarcation between the focus and margin is rather too sharp and abrupt, so that soon after the object is removed away from the focus to the margin of attention the energy is completely diverted to the next object which now takes its place at the focus. In some persons of exceptional mental capacity, as illustrated in the above, part of the mental energy remains with the margin though the focus usurps the major part of the energy. The sound of the conversation he had heard a moment earlier does not disappear behind the mental oblivion, it could be easily linked with the next bit of conversation appearing at the focus. To expect such psychological feats from the pupils in the class would be to prepare for disappointment, and to expect the fluctuation of attenion to be stopped would be to invite frustration.

(c) *Span or Range of Attention*

The maximum number of objects that can be perceived simultaneously indicates the *range* or *span* of attention. It has, however, become customary to use the word span when visual stimuli are used and reserve the word range for the cases where auditory stimuli are used. For determining the span of attention the following experiemnt may be found useful.

Exp. Take half-a-dozen of small rectangular cards. In one of these draw four crosses without observing any order, five crosses in next card, six in the third and so on. Starting with the card bearing the smallest number of the marks hold each card before the Subject for a split second. Ask the S how many marks he had seen. Next take another card and expose it for the same duration as before, and continue the process till the series of cards has been exposed. Note the maximum number of crosses correctly attended by the S. This would represent his span. To avoid the effect of chance a repetition would be advisable exposing the cards without any order. There are various designs of apparatus devised for exposing the materials mechanically and for the desirable duration of exposure ; such a device is known as *tachistoscope*.

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* Such cases are usually referred to as शतावधानी (*shatāvadhāni*) in this country. The prefix *shata*, however, should not be taken literally, it is intended to signify many.

Individuals vary in the different mental functions and abilities. A pupil can be distinguished from another in his span of attention and his fluctuations. One may fluctuate too rapidly and his span may be rather narrow ; another may hold his attention fixed for a longer period and even then the span may not be wide, while the third may tend to fluctuate too often and yet possess a comparatively larger span. Such combinations of the abilities go to distinguish between one person and another and the teacher should better be familiar with the potentialities and limitations of the pupils as far as practicable.

INTEREST

Attention and interest are inextricably mixed together. What interests us we are bound to attend to in one way or other, immediately or somewhat later, directly or indirectly. Interested in drawing a young lad would spend a couple of hours at a stretch in perfecting lines and circles with rapt attention. The same boy while memorizing the rules of grammar may be found inviting distraction all the while. A student who has taken botany as one of the subjects for his examination may feel bored to study and remember the varying patterns of the petals and sepals, whereas another boy of the same age born in the rural atmosphere taking intrinsic interest in the flora would learn all about the flowers knowing not when he had actually started learning about the plant life. The young pupil who took a good deal of interest in map drawing would see in the broken plasters on the wall 'maps' of India and Ireland and would observe attentively to find out if there were any flaws in these 'maps', whereas attention of another boy may simply be flagged to look at the wall more than a few minutes at a time. On the other hand it would be surprising to notice how one's interest gradually grew in a subject which had interested him very little before, provided he could muster his attention to learn the rudiments of that subject. One who took very little interest in, say, mathematics, if made repeated attempts to master the basic rules and principles and worked regularly with a set schedule may find himself taking more and more interest in the subject with his dislike proportionately decreasing. Would it be then justifiable to conclude that it was his attention which was responsible for the growing interest? In answering to this query it should be first inquired what was the reason for his attending to this subject. Surely we do not learn for the sake of learning, there must be a hidden drive behind it. One may learn mathematics for better knowledge in science which primarily interested him, another may learn it because he was loathe to mar his career by failing in the examination, yet another may do so for some reasons of competition, and so on. In other words, the persons had subjected the process of attention in order to reach a certain goal in which they were greatly interested.

From this point of view it would be erroneous to conclude as some have done, that attention and interest were the two sides of the same coin. Invariably it is the interest which drives one to attend, directly perceived or lying concealed.

One may be inclined to ask, what is the source of the interest we evince in our learning? The simple explanation is that he feels some sort of a need or another. It is the need which compels us to take interest in our task and impels our attention towards it. There is hardly any other topic in education which is of greater importance for the teacher to know and appreciate than the need in the pupil.

The need may arise out of innumerable sources. A mercinary soldier learns to fire a gun and aim correctly mostly for financial reasons, an intending sportsman does the same for gaining satisfaction or winning a trophy, a frontier-man may act likewise but for altogether different reasons. Basically, however, they all have a basic need or another at the bottom of their interest.

Education as a process must be correlated at each stage with the appropriate need, and the smaller needs should be knit together to form the broader need. Very often we hear educationists in this country lamenting over the failure of the schemes formulated for educating the illiterate adults. There is no dearth of schemes for adult education, publicity of the success achieved here and there, or talk of ideals to be attained through mass education of the adults, and yet it has to be admitted, regretably though, that none of the plans have succeeded to our expectations. The reasons for our failure, I am afraid, have not been psychologically analyzed.

An average peasant or industrial worker who is already acquainted with the life in its various aspects possesses a rather limited ability to relate cause with the effect. To approach an illiterate peasant, but otherwise experienced, with the intention of convincing him that prosperity of the country depended on his literacy could hardly be effective. There is none who would not take pride in the prosperity and greatness of his motherland; but the poor peasant searches his heart to find any relationship between the prosperity of his country and his learning the alphabets or doing the sums in arithmetic. Presently he may be led away by an influential speaker and start attending the night classes in all earnestness. But very soon he would find the irrelevancy of sacrificing his precious leisure too great, and frustration would get a better hold of the erstwhile enthusiast causing his dropping out. This has actually caused a huge wastage in the sums spent for adult education.

An ardent educationist in this country realising this shortcoming in the approach had tried a simple solution. In rousing the adults' enthusiasm instead of using any vague ideological expression he told them that by learning to read, write and count they would be able to detect for themselves whether the usurer had written the correct amount on the hand-note they took. Now, this particular area happened to be agriculturally very poor and the peasants were in constant debt, and it was often that the usurer took undue advantage of the debtor's illiteracy and ignorance. Anyway, a new vista now appeared before these folk and the results were highly encouraging. In England the adult education movement had reached its climax during the period of industrial revolution there. In quest of a job one learnt very soon that literacy would enable him to learn quickly about handling machines and knowledge in the latter was precisely the qualification which the employers wanted in their employees. Later on, with the growth of industry and wider prospects in education, the elementary knowledge embodied in adult education ceased to be assets for employment. Thereafter there was a decline in the adult education movement never to reach the earlier peak.

The educands in these cases had an unambiguous aim before them, they realized clearly what fruits their labour would fetch. These are the cases illustrating how interest, and concomitant attention, may arise out of socio-economic needs.

The boy who may have put renewed vigour in his efforts to master a subject in order to beat a competitor in his class is driven by the interest growing out of the sentiment of self-regard. None loves any one more than himself, and as the boy finds the regard for his own self being threatened he would not hesitate to put up extra labour to meet the threat.

Interest, again, may be roused by better comprehension. It is quite common to find students suddenly taking enhanced interest in a subject following the change of the teacher or the teaching method pursued. Possibly he possessed interest in the subject at the initial stage but his interest had suffered due to the inadequate teaching method, the subject matter therefore grew more and more incomprehensible causing his interest to wane. A change in the situation for the better would naturally be expected to lead to a spurt.

With the aim of generalising the conditions which are related to the gowth of interest McDougall has stated, "we are interested only in those things that evoke in us one or other (or several) of the instinctive impulses"[1] At first glance such a statement appears to hold a good deal of truth, but further analysis may bring out many facts which fail to corroborate the assertion. How to account for the fact, for example, that one may be highly interested in algebra and remain indifferent to geometry, may take great interest in constructional engineering and show little interest in electrical engineering? Again, following a tremendous interest in stamp collection in a person the zeal may suddenly subside. Modern psychologists are of the opinion that the growth of interest is related to many other factors at times beyond our conscious awareness. Desires of the subconscious mind may explain considerably in this respect. A repressed desire may strive to express itself in an indirect form and our interest may find a substitute. We may have to open this intriguing problem all over again while discussing the propensities of the unconscious mind.

REFERENCE

[1] McDougall, W.—*Outline of Psychology*, p. 276.

CHAPTER XI

LEARNING

DEFINITION

Education is defined as the development of abilities, attitudes, or forms of behaviour, and the acquisition of knowledge as a result of teaching or training of positive value to the society. It has much broader a scope than learning which is defined as 'the process of acquiring the ability to respond adequately to a situation which may or may not have been previously encountered'.[1] Education takes into account of the abilities and behaviour which the individual should acquire or avoid. We would not call it an educative process if the person developed an anti-social habit. But learning represents merely a process of forming the habit or acquiring a skill, or getting rid of one already acquired. Learning does not take into account the ethical values implied in education.

What would be the place of teacher in these respects? The teacher not only teaches but, also, educates. His function does not cease with the impregnation of the pupil's mind with knowledge of skill, he is also responsible for the quality of knowledge that he imparts to his students. He must wean out of his pupil those habits and ideas which are socially undesirable and graft those instead which would benefit the individual and his community. He is, therefore, expected to be aware of the mechanism of the processes in weaning out or grafting. Looking from this rather narrow point of view teacher's functions have been compared with those of a gardner. Provided the analogy is not pushed too far it may serve the purpose of comparison. The gardner follows certain general patterns in rearing his plants but does not lose sight of the individual characteristics in this plant or that. So does the teacher. Neither the teacher nor the gardner has any hand in altering the innate qualities in the child or in the plant. With the aid of nourishment and technical equipments available to them they endeavour to bring out the most desirable qualities in the both.

Could we limit the definition of learning only to the intellectual acts of 'higher order'? Evidently not, we use the word learning in connexion with the acts of mere physical habits as well. Any definition of learning would have to take into account all the physical, psychological and psycho-physical actions which are intended to be built up or destroyed in an individual presuming that the bases of the desired modes of behaviour are already present in that person. It might be purely motor habit as in learning to ride bicycle or reciting a *sloka* without understanding a single word. With patience and useful technique a good deal of such habits could be formed even in the animals. Unfortunately it is on this aspect that the greatest stress is usually laid in education. The proposed definition of learning should also be applicable to the psychological processes, as in attention, in which the physical counterparts have the least influence.

WHY WE LEARN?

Learning is an action, but there exists a gross difference between the expressions: action and learning. For instance, one may be forced to do an act, may be *any* act barring learning. No one ever uses the expression: I was forced to learn! Even in the two expressions learning and training there exists a subtle distinction. A minimum amount of conscious participation in the act of learning is necessary, whereas training could be imparted, as in the animal, even if it remained unconscious or indifferent while it was being trained. Training is akin to the formation of habits whereas learning consisted of conscious or partly conscious process of adjustment in the individual.

As a matter of fact any kind of coercion should be regarded as the worst foe of learning. The only conclusion that could be drawn is that we learn because we wanted to learn. The desire for acquiring habits and modes of expressions, thinking and reasoning, are essential prerequisites for learning to ensue. Psychologically, this desire is known as *motive*.* Motive, the spring of action behind learning, may arise out of innate causes or those superimposed in later life. The duckling learns to swim and the child learns to walk and run of their own accord. The desire in these cases is far from being conscious and yet it is there. The natural drive in these actions is the natural guide. Whereas, the actions elicited in learning in the school situation are carried mainly by virtue of the circumstances imposed on the child.

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* *Motive*: 'A conscious experience or subconscious condition which serves as a factor in determining an individual's behaviour or social conduct in a given situation.' (Warren).

Though the learning process in later life may be very much guided by reasoning it has to be admitted that emotion in its various forms plays quite a significant part. Pleasure-pain principle is the chief motivating factor in learning. Man like any other animal seeks pleasure and avoids pain. What evokes pleasure is repeated and repetition as we shall see later is one of the bases of learning—repetitions in acting and repetitions in avoiding to act. It may be argued why then man takes to such actions in learning which produce pain and not pleasure? The *sādhu* who learns to sit on spiked seats for hours at a stretch or the student who strives to master binomial theorems sacrificing the pleasure of going to the pictures surely passes through painful experiences. But then each of them forsees the pleasure that he would derive later on, the mendicant has his picture of the heaven before him and the examinee would be delighted when he passed the ordeal of examination. Expectation of attaining a goal then is the key-note in learning.

INSTINCT AND LEARNING

From pedagogical point of view the process of learning could be compared, cautiously though, with the skyscraper. The fortieth floor of the skyscraper could not be erected if the thirty-ninth floor were missing, and to expect the complete building hanging in the air without any foundation would require the imagination of Alice in the Wonderland. The superstructure of learning is not possible to build without consolidating the previous stage. Learning of calculus does not depend on age but on the attainment of the previous stages of learning in algebra. But the ability to learn at all would also depend on some of the mental endowments, intellect for example. The limitations in learning in the feeble-minded child are mainly due to the dificiency in the thyroid hormones. Yet, in full possession of these mental endowments the person may fail to learn just because no opportunity was available to him. The lack of facilities may be as strong handicaps as the dearth of mental endowments in the individual.

To sum up, the potentialities in learning, the exent to which one may learn is determined by his innate abilities. We may compare such potentialities with the gun powder inside the shell; whether the shell would burst or not will be determined by the quantity of the gun powder, its dryness, etc. But the potentialities would be of little avail unless there were a mechanism to put the shell into action. Using this analogy one might like to enquire: what is that psychological propensity which acts like a trigger for the learning process to follow? Learning is a form of activity, and for any action to take place use of energy in one form or another is essential. Physiologists tell us that in walking and moving we use the energy supplied by the blood, the source of energy to light the lamp or rotate the fans is the dynamo, for the rice to boil the requisite energy is provided by the fire from the fuel. Let us analyze a few cases of learning and see for ourselves what might be its source of energy.

The boy endeavouring to learn mathematics it was stated earlier had felt the need, this need arose from his desire to compete against others. Is it not a case of self-assertion? The person who at an advanced age may decide to take up a course of study may willingly do so if he were assured of a better job on passing the examination. That is, it is for financial gains that he is prepared to learn. It is not then a case of learning for self-preservation? The boy who has observed over a prolonged period the habits of the birds and animals would learn a good deal of the basic principles in biology, and he would not have done so had he not been driven by the instinct of curiosity. It is, then, the instinctive urges which are at the bottom of the learning activity. Learning is a process and the instincts set this process into motion. The desires and the needs can ultimately be traced into one form of instinctive urge or another. As a matter of fact it would be difficult to imagine how learning at the very early stage could at all take place without any initiative taken by the instincts. As we may now observe learning in the child starts right from the age when it began to make efforts to perceive the objects around it in order to gain acquaintance, and perception is the firm foundation of future knowledge. In the absence of curiosity it would have hardly been possible for this process of learning to start.

WHEN TO TEACH?

In matters regarding education it has to be admitted that our attitude towards the child is certainly on the shift. Exasperation felt in child rearing has at least banished the idea that all children were incarnations of *Nārāyana;* they had all the good and bad points of the adult. But to treat the child as an adult—only diminutive in size—would be another folly. Each of the states of infancy, childhood, and adolescence has its specific place in the continuous process of growth, and each stage should be treated at its face value and the content and form of teaching fitted with the stage.*

In order to be sure whether the opportune moment had arrived for teaching a subject matter, be it table manners or sums in arithmetic, the simplest indicator would be the ability of the educand to grasp the instructions. The next thing is to guess whether the response was beyond his physical and mental capacity. The pupil's capability is the sum total of his inherent intellectual ability to act according to the instructions. In teaching simple arithmetic, for instance, any use of the word addition should be avoided until the child had developed the number concept and the latter could not develop in the absence of any concrete and actual experience. Likewise, his ability to write would depend on the stage of the development attained in the muscular coordination and control, his ability to recognize straight lines and curved lines, etc., and all these require patient building up.

For purpose of comprehending any new idea, then, *mental preparation* is an essentiality. It is a peculiar characteristic of the mind that it loathes to accept anything startlingly new, a stranger of an idea is seldom welcome to the human mind. This simple statement could easily be verified by looking around us, and history will bear abundant testimony to this fact. The gospel of science taken to the primitive people practising witchcraft and magic would be resented as much as was derided the thesis of non-violent non-cooperation when it was first introduced in this country by Gandhiji. In view of the fact that *ahimsā* had an important place in our religious practice and that people in this country leaned heavily on religion they expressed their parital readiness to listen to Gandhiji when politics was somewhat mingled with religion.

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* However, the time has not yet arrived when we could consider our attitude to have radically changed in this respect. The overzealous parents continue to tax unnecessarily the child's mind by coercing it to memorize *shlokas* (maybe to satisfy their own vanity) long before the meaning dawns in it. By dressing the child with clothes befitting the adult, only shorter in size, the belief is induced that after all the child *is* a diminutive man. We continue to feel embarrassed at the child's misdemeanour before the invited guest; such exasperations could arise only when we think of the child at par with the adult. The writer was told the tragic case of the child of four years who in its innocence had once asked its father how sugar is made. Inspired, the good pater narrated to him the long story of sugar starting from sugar canes and ending with the sale of sugar in the shops. Feeling uneasy about the loopholes left in his education he also added how the sale of sugar was controlled by the government (this was in 1952) and that the function of control rested with the Ministry of . . . . !

It may be recalled how the ruler of one of our neighbouring countries in the late twenties had to pay heavily when he forced his ideas of radical reformations upon his people who were least prepared for the same. The events in 1857 in India gave ample evidence of the fact that ideas however beneficial if be introduced without preparing the recipients' mind may produce results not so beneficial after all ; the cartridges intended to revolutionize the usage of arms had contributed considerably towards ushering the revolution.

A few years back, before the last war had made aeroplanes a common sight residents in the remote villages were ready to believe in the man's ability to fly only when they were reminded of the fables of the *monorath*. Aeroplanes, to their mind, were possible only because similar devices had once existed. To a child who has had no access to a fountain pen but who was partially acquainted with the common steel pen the fountain pen is 'some sort of a pen', it may not exhibit any eagerness to examine its specific features and distinguish it from the steel pen because the vague idea of 'some sort' sufficed to it ; man appears to be lazy animal. For a Hindi reading pupil it is easier to learn Sanskrit than Latin because he finds the alphabets bearing similarities ; a Tamil speaking person on the other hand may be interested in Sanskrit for the similarities in the spoken words in these two languages. Mind in absorbing a new fact tries to seek for the likeness in it with which it was already familiar. If the new idea bore some resemblance with the mass of old ideas contained in the mind it is readily assimilated just as drops of alcohol when fall dripping in water easily mingle into it. There are intrinsic differences between water and alcohol and yet there are certain basic similarities. The drops of alcohol continued would ultimately alter the character of the water radically, it will no more be 'water with alcohol' but 'alcohol with water'. Likewise is changed the mind from ignorant to enlightened. But, for this change to appear new facts need be absorbed gradually, assimilated with the aid of the pre-existing ideas and preconceived facts, the new must have a token resemblance with the old and once accepted by the mind the former would eventually find its own place. The mind would begin to realize the differences of the new ideas from the old. This set of previously existing contents in the mind has been given the name of *apperception mass* by Herbart. The new knowledge by virtue of some resemblance with the existing knowledge—the apperception mass—is identified with it, further attention may bring out the points of dissimilarity and would gradually come to be recognised as bearing its own identity, a separate entity.

TYPES OF LEARNING

Learning is a process, a means; the means would then vary according to the ends to be attained, and the types of learning would be different depending upon the ends in view. The simile of firing may be appropriate in describing the types of learning. Accidental firing may kill a person just as well when he was purposively aimed at. The process of killing in both the cases though is the same law would take into cognizance of the attitude behind the act of firing. Again, the person who fired at an innocent person may be hanged but killing in the battle would fetch rewards. The types of learning could be treated likewise.

(*a*) Learning may be *accidental* or *instrumental*. While travelling on a train to and from a particular station every day an illiterate traveller may notice casually the letters written on the boards depicting names of the stations. Being already familiar with the sounds of the names he may combine in his mind the sound and the respective word picture and thus may learn the alphabets. This would be a case of accidental learning. Evidently it is unreliable, time consuming and an incorrect method in learning. Many of the things learnt during the early childhood belong to this category. Learning is the modification of behaviour through experience. Experience here evidently implies to the conscious experience and there is no reason why one should consciously attend for modifications in him unless there were a goal for him to attain, he wanted to make use of his experience in the future. This learning that he had acquired he intended to make use of in successfully negotiating similar situations later in life. That is why this process of learning is called instrumental.

For the above classification we have mainly relied upon the attitude of the learner, i.e., whether he remained indifferent when learning was taking place or he actively participated in the act of learning with a purpose.

(*b*) Learning may, also, be classified according to the means employed in the process. It is a case of *motor learning* if emphasis were laid exclusively on the organic aspects in the process. By sheer repetition of the act an individual could bring about those changes in himself which go by the name of learning. Habit formation is a kind of motor learning just as is memorization without understanding, the latter being known as speech habit. Efficiency in drawing arises mostly from motor learning. This means of learning has also its characteristic end in view; the aim in the kind of learning is to gain efficiency in performing the act and nothing more. The boy who had learnt a poem by rote memory without any understanding had achieved success in one direction only, viz., its reproduction; he could now 'read' the poem so to say without actually looking at the book, and maybe he could now repeat it in shorter time that it had taken him at the beginning.

On the contrary, *ideational learning* or *insight* lays emphasis on the comprehension of the subject matter. Reading the poem only once could enable the pupil to write it down in his own language though not *verbatim* provided reading was combined with understanding.

Obviously this changed means in the two types of learning has also brought about changed aims. Whereas in the ideational learning the aim is to gain a correct idea of the content, in the motor learning the end in view is to acquire facility in performing the act, it is the reproduction of the form alone which mattered in the latter.

(*c*) Products of learning may be compared from the standpoint of social gains attached to them. To understand this classification it should be borne in mind that an individual is a part of the society in which he lived. Judged from this broader point of view we may look upon the learning process as a means of bringing about better social relationship. Success in learning in this case would be judged not only from the standpoint of reproduction of the material but also from the appropriateness of the reproductive process. The child on being taught to wish a person may do so seven times on the same day if chance brought them together. This he would do mechanically without realizing the social ends in the act of wishing. Such acts of habit no doubt have their own values during the initial stage of education but perfection and competency will be attained when relevancy and aptness are recognized. It is only when the act learned is repeated in its proper setting that we could speak of the child as having gained *social competence in learning*.

(*d*) Learning, on the other hand, could be used for building up *creative* thinking in the individual. Learning is not an end in itself; it results not only in the comprehension of the content learned, enabling him to repeat it more efficiently but, also, prepares him for those actions which were not experienced earlier. It is expected that the learner by taking advantage of his previous experience would be ready for creative activity and thinking. Whatever method we may follow in teaching, the years of schooling can offer the child only samples of experience. It is impossible to teach it everything for mechanically applying its knowledge in the later life. The child has to prepare itself to meet the divergent situations and should be able to apply his past experience to solve the problems unexpected. Learning then would cease to be mere acquirement of knowledge, it would be acquirement for meeting the requirements arising in later life.

ANALYSIS OF LEARNING

Psychological experiments have extensively contributed in the domain of learning. Teachers of today as in the past have been equally desirous of obtaining the most beneficial results in their teaching. But, previously they were handicapped in the absence of any precise knowledge in matters of learning resulting in the undue emphasis on memorization. By analyzing the process of learning we obtain a clearer view of the ways how learning took place when different types of materials were used by the students of different mental calibre. Scientific education rightfully gives importance to the process of learning since our knowledge in this matter would go a long way in increasing the output of the pupil and saving him from being taxed unnecessarily.

To sever ourselves from the traditional belief, let it be banished from the mind that there could be any single way of learning or that memorizing is *the* way of learning. Learning of the rules of syntax, for instance, could not be placed on the same footing as learning algebraic problems or to compose essays.

The subject matter for learning could be analyzed into two broad groups, and the process employed in each case would naturally vary. In the process of learning which relied mostly upon cramming or rote memorization the materials are preserved in the mind in a linked fashion. Formation of associative bonds between one expression and the next is the sole objective here. To judge the achievements all that is now required is to bring to the mind one of the ideas, expressions, sentences, and the rest would follow in a stereotyped manner. This unvarying pattern in the response is the characteristic of learning by memorization. If the young pupil were asked how much is five times six he might reply straightway provided the associative bonds between the question and the answer were sufficiently strong. Usually he would start with the beginning of the table of six, . . . 3 times 6, 4 times 6, 5 times 6. But this type of learning is not limited to the young pupils alone. Even at the college level the student when is asked to describe the influence of hereditary factors on education he is often tempted to write not only about heredity but, also, all that knew about environment in relation to education without waiting to scrutinize the justification for such an answer. Such an absurdity is the direct outcome of relying too much on memorization—the habit aspect in learning, since heredity and environment are usually discussed together in the text books the words heredity and education act like the triggers for the ready-made chain of reactions. This sort of learning differs very little from the learning process involved in, say typewriting or riding bicycle or in correctly holding the pen in the child. If there be any difference it is on the emphasis laid on the mental or the organic aspect. In correctly holding the pen there are formed—unawares though—neuro-muscular associations whereas in memorizing the multiplcation table the associations are of psychological character.

The process employed in solving problem is of altogether different category. Comprehension is the keynote in this kind of learning ; correct understanding of the relation between the problem in view, holding the possible solutions before the mind, and choosing the correct answer are the requisite steps. Mere 'brute' memory is of little avail in such a case. When the pupil is asked to generalize the salient issues in historical event, or draw the lesson from the tale, he has to be remindful of the terms in the instructions and the material before him out of which he has to select only those which are relevant to his purpose.

EXPERIMENTAL FINDINGS

Investigations conducted in analyzing the learning process are numerous and varied, and the factual data that we now possess throw a considerable light. These experiments have been carried on in the adults, children and also on the animals. It may be asked as to why experiments on the animals should be recokoned in discussing the psychological process in the man. Science demands that we study a phenomenon not only in its present form but we should also determine the earlier stages from which the present state has emerged or evolved.

The botanist's curiosity is not set at rest on studying a plant as it is ; he next endeavours to study the origin of this particular species, and then the plants in general, his ultimate aim is to find out how life came into existence. Likewise, in studying the characteristics of the human mind psychologists are curious to learn about the origin of the mental phenomena. After all, the past history of the man is closely related to the history of the animals. In order to determine the origin of the human mental phenomena those of the animals need be taken into consideration, a better explanation thus could be found out of the evidences. But there is another reason no less important. In analyzing a mental phenomenon we desire to study it first in its purest forms as far as possible. But these characteristics in the human being become very much intermixed in the course of training as he grows. In the animal, however, they remain in a comparatively purer state. The results of our study when are compared with those of the animals give better insight into the problem.

In one of the earliest experiments performed on the animal Thorndike used cats as his Subjects. The apparatus consisted of a wooden cage in which was placed a hungry cat while food was placed outside the cage in full view of the animal. Certain contrivances were so adopted that the animal could escape out of the cage provided it pulled and pressed several levers of the cage. The animal repeatedly put in the same situation gradually learned·how to open the door in less and lesser time. Not all the cats used behaved in the same manner, nevertheless, one could notice the general trend in their response.

In one of such experiments the animal in its first trial took 2 min. 40 sec. to get out of the cage. After repeating the performance for a couple of dozen times the animal took much less time for the same actions, and the last attempt took only 7 sec. We thus learn that *saving time,* which means *increase in the output,* and *reduction in the errors* are characteristic features in learning. It may be argued whether the cat in learning to open the cage had experienced similarly as we would in learning a geometrical problem. One could not say for certain, but the probabilities are that rudimentary forms of thinking it must have experienced. This of course we can only conjecture through the lessening of the time consumed by the animals, and also, by comparing its behaviour patterns with those of the man under not very dissimilar circumstances.

Köhler's studies in the higher apes will remain a classic investigation in animal learning. Using gorillas and chimpanzees for his experiments he put them in a less confined space than the cats in Thorndike's experiments. Bananas were placed outside their reach and nearby were placed pieces of bamboo stick. It did not take the animals long to see that these bamboo sticks could be made to serve as useful tools where arms failed to reach. Next, the food was placed farther still and several other pieces of bamboo were left near the animals, some of these could be pushed inside others and the implement thus devised made longer than when used separately. Once more the animals succeeded in the task. When the bananas were hung from the ceiling and empty crates left in view of an animal it ultimately learned how two boxes placed one over the other underneath the bunch could make the fruits accessible. And, in all the cases when the experiments were repeated the animals took less time to solve them, also, the errors in using the implement diminished. Such attempts could be compared with the young pupil's achievements in solving the arithmetical sums as he practised.

Gessel and Bühler have conducted similar investigations on young children and with nearly the same results. Their investigations though were aimed at the assessment of the intellectual growth among children the nature of tests and their results supported the earlier findings. Children of thirteen months were placed in cribs and left to play with small drum sticks. When they had learnt to handle the sticks a top was placed outside the crib out of reach of the child. Very soon the child learned to use the drum stick as an implement for reaching this new object. If the child was supplied with two hollow sticks, one narrower than the other, and if the top was placed farther still, the child started with its usual efforts for reaching the object with its bare hands, failing it next used one of the sticks, failing again it manipulated the sticks so that one was inserted inside the other and the article thus reached at.

Our traditional beliefs may make us shy of using the facts obtained in the investigations. Despite the previous explanation one may feel hesitant to take lessons from these investigations. It would, therefore, be advisable to compare the results obtained in the experiments in which more familiar materials were used.

Innumerable investigations have been conducted on the human beings in order to study the essential features in learning, and use of maze is found quite useful in such investigations. In getting out of the maze one would profit little from mere repetitions of the act unless he also tried to grasp the whole set-up. A simple experiment is described below.

The Subject (age 8 yrs) here was instructed to start at the centre of the maze (Fig. 15) and mark her way out with a pencil. Time taken in each trial and the number of errors are noted in the Table 1.*

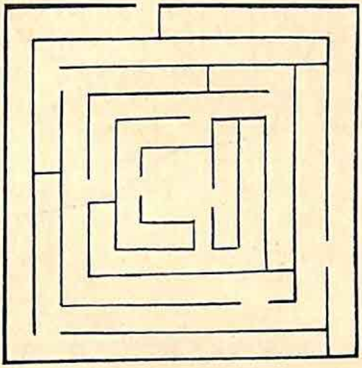

FIGURE 15

TABLE 1

Result of practice in Maze Drawing.

Date	*Number of errors*	*Time in seconds*
16.4.53	14	519
17	10	332
18	11	318
19	10	214
20	8	206
21	6	200
22	5	160
23	4	143
24	3	137
25	2	120
26	0	70
27	0	50

The numerical data in the Table 1, are graphically represented in the Fig. 16. This graph may be compared with another telling a similar story. Fig. 16(a) represents the time taken by one of Thorndike's cats in its successive attempts in getting out of a cage specially devised for the purpose.[2]

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* This experiment was conducted by A.S., a post-graduate student of Education of the Gauhati University.

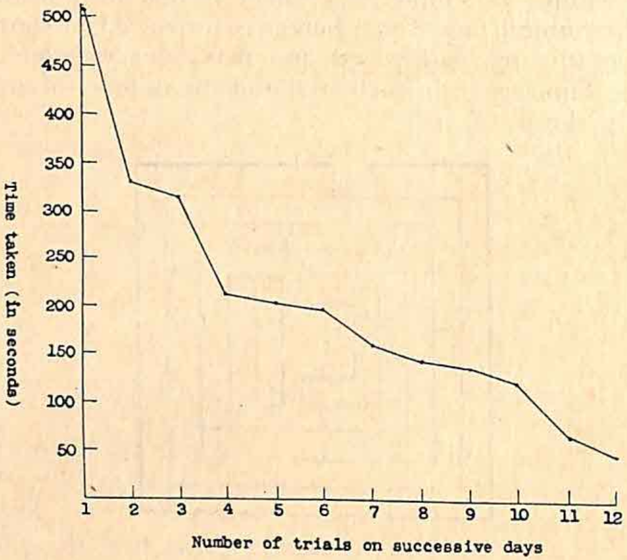

FIGURE 16
LEARNING CURVE OF A CHILD (8 YRS.) IN A MAZE EXPERIMENT.

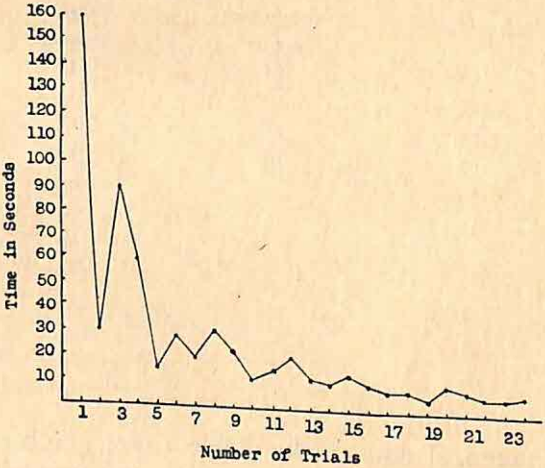

FIGURE 16(a)
LEARNING CURVE OF A CAT IN ONE OF THORNDIKE'S EXPERIMENTS.
Note the abruptness in the reduction-time taken in each trial. Compare it with the Fig. 16.

The fact that one of these experiments was carried on a child and the other on an animal does not make any material difference in the results. In each case the successive outputs do not show any radial improvement over the previous efforts, nevertheless, it is obvious that all through the repeated attempts a general progress is maintained. Secondly, if the graphs were divided into two halves, it could be clearly noticed that the gross improvement in the first half is by far the greater than at any later stage. Thirdly, the benefits from learning is not retained in full. Were it so, all the successive results after the first attempt would have shown more or less similar results. If more time was taken in any particular trial compared to the previous effort, it is because of the Subject's partially 'forgetting' what he had learnt previously. This fact would become clear if the number of errors noted in the Table 1 were examined. Fourthly, then, learning may be described as a progressive series of mastery over former deficiency. These are the broad features in learning taking place in problematic situations, i.e., in ideational learning.

It now remains to be seen whether the abovementioned facts may also be applicable to the motor type of learning where the main object is only to reproduce the subject matter in a more efficient manner, comprehension playing a minor role. While learning to ride bicycle for instance the learner does not look for the relevance in his actions as he would do in solving jig-saw puzzles. So would be the case in learning typewriting, memorizing nonsense syllables or even poems 'by heart'. Understanding of the whole set-up may be partly helpful but it is the repetition of the action which is of paramount importance in such cases. Outwardly these different types of work may not bear any resemblance but performance in all these tasks demands less of conscious experience and more of unconscious adjustment. Below is described a concrete case.

I.C., a girl of 10, was trained to trace over the drawing of a cross which itself remained screened out of her sight. This is known as mirror drawing test and the apparatus used is shown in the Fig 17. The figure to be traced can be seen only as a reflection in the mirror placed before the drawing. Since the movements of the arm were guided by the reflection and had to be made all upside down, in the beginning the S felt it difficult to control the movements and a large number of errors were only to be expected as also the time consumed in each trial. But in the successive attempts the required

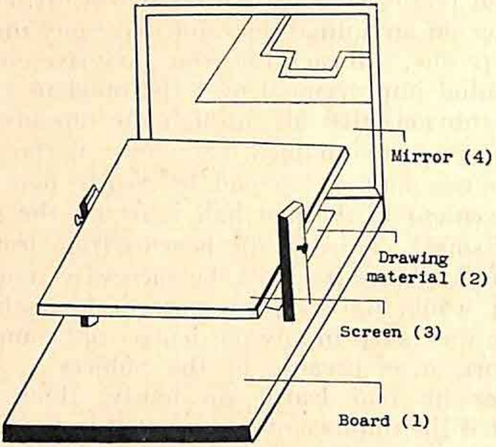

FIGURE 17
DIAGRAMMATIC SKETCH OF MIRROR-TRACING SET-UP.
(1) Board on which is placed the drawing (2) which is hidden from view by the adjustable screen (3). The S can see only the reflection of the drawing in the mirror (4).

TABLE 1 (*a*)

Result of practice in Mirror Drawing.

Days of practice	*Number of errors*	*Time in seconds*
1st	70	420
2nd	68	310
3rd	66	243
4th	69	211
5th	52	210
6th	42	184
7th	39	180
8th	35	182
9th	42	171
10th	31	176
11th	24	178
12th	17	180
13th	20	178
14th	21	181
15th	24	180
16th	14	220
17th	10	176
18th	8	161

physical adjustments were successfully made and the errors decreased remarkably as also the time taken in the tracing.

The results are shown in the Table 1(a) and graphed in the Fig. 18.*

Edward[3] had made a laborious investigation in the learning of typewriting. The Subjects were given fifty hours of initial practice; no record was kept of the day to day output during this period. When all the Subjects had practised for fifty hours, each was given a fresh practice of one hour duration and the number of correct words typed during the last five minutes were recorded. Out of the ten cases reviewed by Sandiford only two cases have been selected here for their conspicuous results. The successive output in these two cases, till they had completed 360 hours of practice, is shown in the Table 2 and graphically described in the Fig. 19.

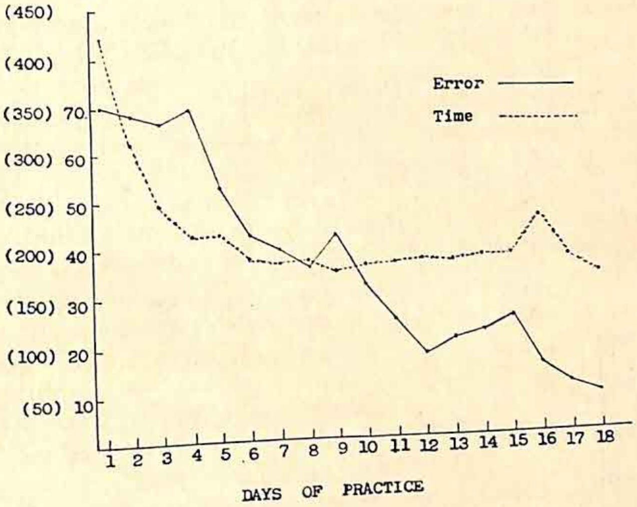

FIGURE 18

Curves of learning depicting the gradual decline in the number of errors and the time taken in the practice in mirror-tracing. The numericals within brackets on the line of ordinate are the units of time in seconds, the rest are the units of errors.

In the course of about 300 hours of practice the first Subject (DA) showed an improvement to the extent of 456% and the other 725%. The maxim 'practice makes perfect' thus bears testimony of numerical facts. However, in this type of learning it is the organic aspect which receives greater atten-

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* This experiment was conducted by A.S., a post-graduate student of Education of the Gauhati University.

TABLE 2

	Hours of Practice								
Pupil	50	60	70	80	90	100	110	120	130
D.A.	73	99	116	148	171	111	176	186	171
M.R.	40	106	147	149	154	118	165	167	199

	Hours of Practice								
Pupil	140	150	160	170	180	190	200	210	220
D.A.	206	201	208	200	221	220	229	235	236
M.R.	191	194	205	224	211	223	247	263	277

	Hours of Practice								
Pupil	230	250	260	270	280	290	300	310	320
D.A.	230	180	230	219	216	253	270	253	261
M.R.	269	199	220	241	221	237	252	249	253

	Hours of Practice			
Pupil	330	340	350	360
D.A.	256	290	304	334
M.R.	250	260	276	290

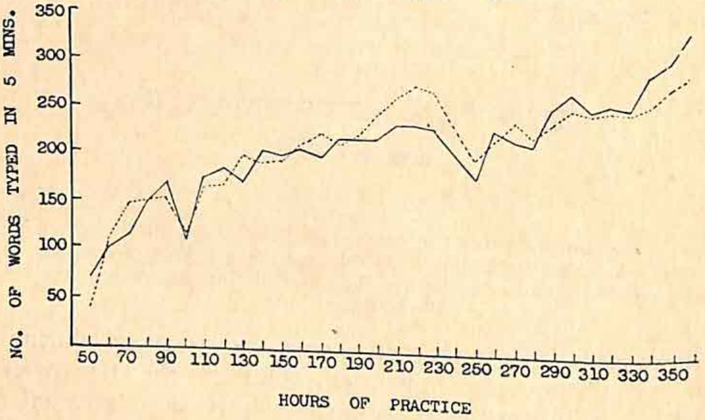

FIGURE 19
LEARNING CURVES IN TYPEWRITING OF THE SUBJECTS D.A. (CONTINUOUS LINE) AND M.R. (BROKEN LINE). FOR DATA SEE TABLE 2.

tion. It is not denied that mental effort too is needed in typewriting but admittedly such actions as coordination and control of the muscles of the fingers and the joints are of greater value and therefore receive more emphasis in this work.

To see what effects practice may have on the type of work which is primarily mental in nature the following investigations may be mentioned. Testing 38 pupils and using words as experimental material, Smedly found that the number of correct responses after the first hearing was 47%, 55% after the second hearing which rose to 59% when the experiment was repeated once again.[4] Similar results were obtained in two other investigations mentioned by Woodworth. In the first one, over 70 children of the kindergarten stage were given continued practice resulting in the increase of the average memory span for digits from 4.4 to 6.4, the latter being the norm for 10 year old children. After cessation of the training this increased span came down to the level of the old average.[5] Using similar materials another set of workers found that the memory span among the college students could be enhanced to about 20%.[6] On the bases of the facts depicted in the tables and curves* shown before the process of learning may be generalized in the following statements.

1. Contrary to the popular belief *learning does not result in continuous improvement*. The usual mode of achievement may be described as a series of progress, retrogression, progress, and so on. Judged overall, the progress is apparently greater than the recession or else, learning would not have been possible. Fluctuation in the output is a characteristic feature in learning.

2. *No two individuals show exactly the same results in their* learning. If two persons of similar mental calibre and enjoying the same environmental conditions were to start learning together something which was new to both, the rate of progress in them could not be expected to be the same. The factor of individual variations is clearly visible in the Fig. 19.

3. *Practice enhances learning, cessation in practice retards progress.* Both the Subjects in the Fig. 19 had maintained more or less steady progress in their improvement till the 90th hour of practice after which there was a conspicuous detereoration. As stated by the author this was due to the fact that a vacation had intervened in their practice. The result following the first practice after the vacation—as represented in the output after the 100th hour—showed a considerable retrogression in both the cases. A similar occasion caused yet another decline after the 230th hour. These were the two periods in the whole series of practice when progress had received a set-back.

4. If lack of practice diminished learning *resumption of the practice would bring about improvement*. This fact is clearly noticed in the graph.

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* Graphical representation of the progress in learning is popularly known as *learning curve*.

5. *On certain occasions despite the learner's efforts practice results in little or negligible improvement,* and this period of stalemate may unhappily continue for some time. In the case of the Subject M.R. in Edward's experiment (Table 2) no significant improvement took place during the period covered by 300 and 330 hours of practice, and so was the case of D.A. during the period of 140 and 170 hours. Such long hours of practice bearing no visible improvement may cause disappointment in the learner as also in the teacher but these should be considered as natural and accepted as unavoidable phases in learning. Such periods of stagnation are known as *plateaus.* Borrowed from geography the term signifies the phases in learning when the progress maintained on earlier occasions is interrupted but may be resumed again. The reason for this phenomenon remains obscure.

6. *The rate of learning all through does not remain same* even in the same person learning the same subject. In the Table 3 are laid down the average improvement in typewriting between the practice periods 50-90 hours, 180-220 hours, and 320-360 hours. (The improvement in each case has been determined by calculating the difference in the output between the ten-hour-periods of practice. For instance, improvement in the five minutes after 60 hours is 26, after 70 hours it is 17, after 80 hours 32, and 23 after 90 hours of work. The average improvement then would be 26+17+32+23 divided by 4, or 98/4=24.5 between 50 and 90 hours of practice). The progress obviously is greatest at the initial stage. The improvement noticed during the first stage in learning in the above table is never surpassed later on. That is to say, output in the improvement in learning slows down as we progress further, this tendency is known as the law of diminishing returns.

TABLE 3

	Average improvement between		
	50-90 hrs.	*180-220 hrs.*	*320-360 hrs.*
Subject D.A. ...	24.5	3.7	18.2
Subject M.R. ...	29.7	16.5	9.2

(7) *Learning has its limits after which no amount of practice could bring any effective results.* By practice one could not expect to run fifty miles an hour. Though it is rather difficult to determine exactly the limit that an individual may reach its approach may be guessed by the insignificant returns in the improvement following continuous efforts.

Such experiments have substantially contributed towards the enrichment of our knowledge regarding the process of learning, it has now ceased to be a mysterious phenomenon. Learning is the mental state in action and the modifications which are brought about are based on some definite principles which can be verified.

In the above studies emphasis has been laid upon the quantitative aspects in learning, that is, on the output in learning caused by practice. It is proposed that the qualitative study of learning, viz., investigating the distinction between motor and ideational learning, be withheld till a later part in this chapter.

ECONOMY IN LEARNING

Psychology tells us the bare facts in learning which a teacher may profitably employ. In the above findings we have got some hints regarding the nature of learning, knowledge of which would enable the teacher to know beforehand what to expect from the pupil. But position of the teacher is not exactly similar to that of an investigator. If the former made use of the psychological findings it is because he had definite ends in view ; adoption of the economic means in learning is his aim. Those factors would be recounted now which contributed towards the economic ways in learning in the class room situation.

WILL

It is true that clarity in our knowledge regarding the underlying principles in learning has offered paths more economic and comparatively easier. But all this knowledge would be useless in the absence of the desire to learn. No technique could be made a substitute for zeal and will to learn. Perseverance arising out of the desire to learn is the mother of all knowledge. This power alone could break open the closed doors of any obstacle. And will is mainly derived from interest, direct or indirect. That will is directly related to interest is a well known fact. But similar ends may be attained if the subject matter were indirectly related to one's interest. A student may dislike mathematics and therefore learn it half-heartedly. If however he happened to possess interest in science and desired to pursue his education in this subject then this understanding may enhance his interest in mathematics. Once his interest led to the increased will to learn mathematics, once the need was realized, techniques in learning quickly he may himself try to devise.

CONCENTRATION

Allied to the factor of will is that of concentration. A poem may be learned without any understanding and even without any concentrated effort. Repeated practice may show the desired effects though it would be at the cost of time and energy. But in the presence of the will concentration in effort may be naturally expected. Concentration is the outcome of will as will is the outcome of interest. There is no "quick way" or "sure success" in increasing this all important aid to the learning process. Realization of the necessity to learn and unceasing efforts to combat against diversions in attention are the twin aids to concentration.

MATURITY

We could not think of teaching in any sphere in the absence of the requisite maturity in the individual. If an infant had failed in coordinating his fingers in holding larger objects it would be futile to teach him now to hold a pen or pencil. This is an illustration to show the relationship between learning and physical maturity. Similarly, we have to think of mental maturity. Teaching arithmetical sums to a child who has not yet developed number concept would hardly bear any fruit. Mentally or physically a stimulus can produce the best effects only when the organ or the organism has reached the proper state of maturity.

FLEXIBILITY

Practice as we have seen is an essential factor in learning. But practice is not synonymous with mechanical repetition. Even in such matters where repetition of the process may prove fruitful, as in typewriting, ability to select the requirements, and to practise upon them brings forth effective results. But selection of the requirements is not necessarily a conscious act, at the most it is a half-conscious appreciation of the need. In his first few attempts the amateur typist begins to realize his handicaps, e.g., he tends to press two fingers when one should remain stationary. He has now to adjust his fingers for greater flexibility. In 'expressional subjects' as in drawing, essay writing, or in handwriting, practice can produce the best results when combined with flexibility, and adjustments made as the situation demanded. Learning to hold the pen correctly requires adjustments which could not be taught but should be learned through actual experience in practice. Similarly in writing essays the pupil at the initial stage is apt to copy the style of the teacher or someone else, but the latter should be on the lookout that the pupil did not merely repeat the same style of writing or else his own would never develop. Flexibility, therefore, is an important criterion in the improvement in learning.

RECALL

We now possess abundant factual evidence to show that it would be profitable to combine recall in learning than to remain complacent about the efforts made. The usual habit among the students engaged in memorizing is to stop when he had a vague feeling of satisfaction. It is often that this complacence arises out of boredom. However, in such practice there is no way of judging how far the individual may have done justice to his task. The best way is to try to recall and test for himself how much of the material he had actually learnt. Gates and others[7] quote an illuminating experiment in which learning was combined with recitaion. School children formed the Subjects in this investigation, and they were divided into several groups. All the groups were required to learn the same amount of material. Only one group was allowed to follow the usual method in memorization and was asked to stop when the participants 'felt sure'. In the rest of the groups the Subjects were required to spend a part of their time in reciting after learning. The total amount of time devoted to recitation varied with the different groups. In each of the latter cases, as compared with the one which learnt without reciting, much larger amounts of material were retained. The investigation indicated in general, that longer the time that the Subject spent in reciting the larger is the amount of material retained. This result applied to all kinds of material used—nonsense syllables, vocabulary, and arithmetical facts alike. Recitation helped equally in immediate and delayed retention.*

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* If the Subject were required to reproduce the subject matter in the test immediately after learning it would be a case of *immediate retention*. If he were required to reproduce it after a longer interval the same test could be called *delayed retention* test. In reproducing a drawing sketched on the board or in taking down dictation the pupil used immediate reproduction; in memorizing a poem and reproducing it several days afterwards he makes use of his capacity for delayed retention.

In the 'skill subjects' like arithmetic, application of this knowledge could be extended for beneficial results. Multiplication tables could be learned quicker and retained longer if the learning trial were followed by sums requiring help of the tables; likewise, vocabulary in the pupil increased in proportion to the words learned and then put to usage.

WHOLE AND PART LEARNING

The problem here is whether it is economical to learn a subject piecemeals or if all the component parts were learnt together. If a poem were to be memorized what should be considered the most profitable way of learning—memorizing the poem as a whole, memorizing each stanza separately, or two or more stanzas were to be combined together as units? In teaching simple addition of four columns of figures should each column be thoroughly taught before proceeding for the next column or should all the columns be considered together as one for teaching? In training a child to write should it first be thoroughly taught how to retain the pen between the fingers and then trained in holding it against the paper to be followed by training in the writing movements, or would it be more scientific to rectify each defect as it appeared while it was engaged in writing?

One might feel it difficult to answer straightway since the illustrations appear to be different in nature, but then, learning—particularly in the class room situation—is *one* psychological phenomenon the subjects though may vary. In learning a subject the pupil neither relies solely on his memory nor on his apprehension, he has to combine both.

It is commonly held that in learning a poem for instance, the different stanzas should be learnt separately though the teacher is not sure whether by learning he meant understanding or memorizing or both, and our means may have to be different to meet different ends. However, the logic of the argument advanced is that the whole consists of parts and if the latter were not learnt neither could be the whole. But psychology does not always follow the path of logic. This is shown by the classical investigations of Pyle and Synder.[5] The Subject here was required to memorize materials selected from Dante's Divine Comedy. Certain number of lines in the one selection were memorized in bits, the same number of lines from another selection were memorized by repeating all the lines serially. The latter method invariably proved to be less time consuming. This conclusion was found to hold in all the experiments in the investigation when varying lengths of selection (ranging from 20 to 240 lines) were used. Since only one Subject was tested here reference may be made of investigations where larger number of Subjects were employed.

Meyer[9] found 48 out of his 53 Subjects doing better by adopting the whole method, and saved thereby about 15% of the time required in learning.

But there is another side of the picture too. Using school children as his Subjects and poetry as the material for testing, Winch[10] found the part method as comparatively more suitable than the whole method. Whereas G. O. McGeoch[11] failed to find any particular method to be uniformly preferred irrespective of the type of materials used.

Evidently then the problem of whole *vs.* part method remains open, and no side could claim of any decisive superiority. This is found to be so if the problem were looked upon mechanically as in the above experiments. Retention is not dependent upon the length of the material alone, but on the number of information units contained in it. For the sake of economy, mind perforce uses its selective capacity. When a story is told to a child it does not attempt to link one sentence with another but one fact, event, or incident with another. These information units are then knit together and retained as a complete story. While recalling the story it unfolds the units in its individual way. A poem could not be mechanically reduced into units of stanzas though they are so composed, neither a story could be analysed into so many pages or paragraphs. The first two stanzas in a poem may be closely related in meaning while the third may have very little in common with either the second or the fourth. To divide the poem then into mechanical parts would be meaningless. On the other hand to force a long poem on the child would be taxing its comprehension, its ability to memorize, its interest and patience.

To start with, the content of the poem may first be explained. Next, each stanza should be separately dealt with, explaining the meaning of the difficult words, analyzing the content and paraphrasing them, and so on. When all the stanzas have been treated likewise the poem should be read all over again for the final linking of the material in the mind. Learning in the school subjects being a combination of understanding *and* memorization, the first part of learning would thus be achieved. As regards the second part in learning, viz., memorizing the poem in the present case, no mechanical means may be adopted. If the first two stanzas were closely related in meaning, the third stanza told another event, the fourth, fifth and the sixth recounted a separate incident, in memorizing then it would be advisable to consider the first two stanzas together, the third separately, and the last three together again. This way the poem would be divided into three convenient units.

From the above points of view the prevalent method requiring the pupil to memorize definitions in geometry or geography before explaining these is certainly unscientific. The definition of a triangle could be better understood if the pupil possessed prior knowledge about angles and straight lines and their mutual relationship. Memorizing the definition of island would be of little value unless comprehension of island had already taken place in the pupil. Once comprehension had set in memorization would become a simpler process and technique for the latter would depend on the type of material used, the age of the pupil, his individual ability and such factors.

DISTRIBUTION OF PRACTICE

In general it may be stated that it is much better to distribute the learning than to attempt completion of the task at a stretch. In the absence of proper guidance it is often that the learner is unable to check the temptation of 'having done with' the lesson at one sitting. His logic might run on these lines: if it took three hours to learn the whole of it why not finish it in one day? Ebbinghaus found that if a series of twelve syllables took sixty-eight repetitions to memorize in one day, it could be done as well with thirty-eight repetitions distributed over three days. This way boredom and fatigue, the twin enemeies of learning, are reduced and the material settles in the mind slowly but decisively. However, the type of the lesson and its size also have to be taken into account.

NEED

Learning being often effected in a social set-up it could not remain unaffected by the latter. Now will be considered some of the important social factors which stimulate or hinder the process of learning.

On a previous occasion we had seen how interest can act as a compelling factor in learning. But need is somewhat different from interest; it lays stress on the social aspect whereas interest is more personal and individual. For the sake of enhancing one's earning one may be led to take up a course of specialization in his profession. He might or might not like his profession, and any further specialization he may altogether dislike and yet his environs, the economical conditions in this case, may compel him to keep aside the matters of his personal interest. It is the need which would ultimately triumph here.

GUIDANCE

One may learn to type using only two fingers on the 'look and tap' basis, but experience would later convince him regretfully that had he received proper guidance in a more systematic and thorough method he could have increased his output and lessened fatigue. Owing to the lack of guidance in learning a language, particularly a foreign language, one may secure the ability to read somehow the printed text, but in the absence of systematic training and guidance from one who knew it well the pupil would not gain proficiency in writing or conversing in that language. Evidently his labour would fail to produce the best results.

END IN VIEW

All human actions of conscious nature have one or other end in view, a goal to attain; learning could not be bereft of this characteristic. In active learning if the individual could see clearly the goal he wanted to attain he would put forth greater efforts than if the goal were vague, indistinct or too far away. Students attending educational institutions are conscious of the fact that they would have to appear in examinations, that is why they take their work more seriously than those 'private' candidates who think of appearing the examination 'some day'. For similar reasons the examinee intensifies his efforts in proportion to the proximity of the examination.

Reward is the most suitable expression to describe the end in view. Learning in the absence of reward would hardly be possible to achieve. The animals, as described in connection with the experiments in this chapter, were motivated by the material reward in the shape of food; the infant follows the mother's instructions for the reward of a toy or even a caress; the pupil is guided by the stimulating reward of a prize or scholarship, and the adult has his own rewards of diverse kinds. Rewards need not be considered merely from pecuniary point of view, not in the child at any rate. The child, unlike the adult, is least affected by monitary reward and most by social recognition. A pat on the back, a smile from the teacher, named in the class as the 'first boy' are the rewards for him which no money could buy. In the adults, too, social recognition is a powerful reagent. If the Moghul rulers made gifts of land and property in recognition of one's services, under the British regime the titles bestowed produced similar effect, and in Russia the *stakhanovite* movement is based on the same principle.

The situation in which more than one person has the same goal to attain arouses *competition* among the individual members. As they vie each other for the reward the competition thus created raises the standard and efficiency of the work among the individuals. Since the spirit of competition in the young is great, opportunities plenty in the class room, and since it does not cost materially for these rewards, a teacher should never neglect to take the best advantages of competition among the students even in the day-to-day class teaching. In the routine work much enthusiasm could be created just for the sake of a look of admiration from the class mates and the pupil would strive harder for this simple incentive than he could be induced to do through any other means.

PUNISHMENT

The widespread use of punishment, which has far from disappeared, may have created an impression that it is a means to induce learning. Punishment was believed not only to eradicate a habit already formed but, also, to serve as an impetus to learn. It is true that fear at times may facilitate an instinctive functioning but learning itself is not an instinctive act. If interest be the source of learning, fear (the inherent quality in punishment) then would nullify interest and so inhibit the learning process. Fear may be instrumental to training as in the animals, but training and learning are not to be treated as the same. If learning were expected to lift the mind to a higher stage fear would inevitably end in degrading it. Slaves in the past were goaded to activity and built the pyramids and the Taj, but only in the capacity of human cranes and bulldozers. No slave has ever indulged in creative activity as we mean by the word. However, the value of punishment need not be altogether disregarded. To consider punishment as an unmitigated evil would lead us to the pitfalls awaiting at the other extreme. In the realities of life rewards and punishments have their due places. Let the child be trained to expect each, but let him realize it as a natural sequence, a just consequence for his wrong doings and punishment then would not produce the avoidable evil effects.[12]

These are some of the ways to be regarded as aids to the learning process.

RADIATION OF LEARNING

A question frequently posed is whether training in one aspect may be automatically transferred to other mental and educational fields. The doctrine of formal discipline born long ago is now dead for all practical purposes, but its spirit still haunts the centres of education. According to this doctrine modifications brought about in the person by formal education in one field is believed to spread in other fields too. If a person gained proficiency and mastery in a classical language and grammar it was believed that the benefits derived would 'naturally' spread over and result in improvements in other subjects as well. Holding tenaciously to this view in England, Latin remained till lately a compulsory subject for all students, even of medicine. Many headmasters even today believe that marks obtained in arithmetic are a reliable indicator of the pupils' achievement in the elementary schools, if the pupil did well in arithmetic he could be expected to do as well in other subjects. It is the same spirit which is found to pervade among the Indian educationists who believe that learning of Sanskrit has its own merits. Reasons offered for such a view are almost of the same pattern everywhere: 'it sharpens the mind', 'it creates mental discipline', 'helps in the learning of other subjects', 'enhances concentration, . . .' Let us turn to facts.

If training in one field automatically produced its effects in other fields efficiency in typewriting should be expected to result in the improvement in one's handwriting. But it is the reverse which is true. By learning to paddle bicycle one neither quickens his gait in walking nor is he benefited in learning to drive a car.

The person, who for the first time had pricked the bubble of radiation of learning, or transfer of training as it is popularly known, was William James. He himself memorized 158 lines from Hugo's *Satyr,* then 'trained' his memory, as it is commonly understood, by reciting Milton's *Paradise Lost* every day for 20 minutes and for 38 days at a stretch. When his practice period was over once more he tried to memorize another 158 lines from *Satyr.* To his astonishment he found that now a larger number of repetitions were needed for memorizing the same number of lines. In other words, training in memory was far from transferred.

Since James' pioneer experiment a number of investigations have been carried using varying types of materials. Technique of the experiments has now been refined and systematized. The methods usually adopted consist in selecting two equal groups of Subjects and test their ability to work in a particular field, say, in A type of work. Of the two groups one is given intensive practice in, say, B type of work (this group is called the *practice group*), whereas the other group (called the control group) is kept idle. When sufficient amount of practice has been given to the control group, both the groups again are given the test applied at the initial stage. Now, in the control group of Subjects, as it may be guessed, there would hardly be any material difference in the results of the tests in the A type of work given at the beginning and the end of the work. In the practice group if there were any significant improvement in the test given at the end it may be ascribed to the practice that this group had received. The basic principle involved lies in comparing the persons who had taken practice and those who had not.

The same principle as stated in the above may be adopted with slight modifications in the technique when individuals instead of groups were used. The following illustration is a typical case.* This experiment was conducted in three stages.

Stage A

Step 1. The Subject was asked to write the letter S as rapidly and as many times as he could for one minute. The output was 40 letters.

Step 2. The Subject was next instructed to write S as fast as he could with his left hand. This the Subject practised for 20 days and for 3 minutes on each day. On the first day he wrote 32 letters per minute, and 50 letters in one minute on the last day of his experiment.

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* This case has been selected from a number of experiments conducted by the post-graduate students of Education at the Gauhati University. The technical safeguards expected to be adopted in such experiments are not mentioned here.

Step 3. The Step 1 was repeated and the output per minute was now found to be 52 letters.

It may be generalized that practising to write with the left hand had resulted in the improvement in the right hand, and learning in this case may be said to have radiated from one field to another field. This result was observed in all the Subjects who had participated in the experiment. It may, however, be argued that this transfer was possible owing to the gross similarities in the two types of work. Could we expect similar results if the subject matter were varied? By virtue of the material used in this experiment emphasis essentially was laid on the physical aspects in learning. What would happen if the material were changed to shift the emphasis on the mental aspect? For the next stage of experiment, therefore, such materials were selected which required a maximum of mental work and minimum of physical labour.

Stage B

Step 1. The Subject was presented for once only with a series of 10 German words along with their English equivalents (*e.g.*, *Amboss*-anvil ; *Kunst*-art ; *Ter*-gate, and so on). He was previously informed that following the presentation of the materials he would be supplied with the German words only and required to reproduce the English equivalents. The number of correct answers after one presentation was noted down.

Step 2. The S was next practised with a different kind of material. He was furnished with a list of nonsense syllables arranged in pairs (*e.g.*, RON—PAM ; TOH—NUR, etc.). He was to memorize the entire list till he could reproduce correctly all the corresponding syllables when the first syllables were read out to him. The S had to memorize several lists of this kind for a number of days.

Step 3. The first step was repeated with a fresh list of German-English words equally difficult as the first one.

It was curious to observe that significant improvement now had occurred about 60% of the cases. In the rest either there was no improvement or it was too little to be regarded as significant. It must have been noticed that the materials used in this experiment differed from the previous one in respect of the former's overwhelmingly mental content.

Nevertheless there was a certain amount of distinction between the control material and the material used for practice; one had meaning, the other not. As regards the difference in the results obtained attention may be drawn to the fact that contrary to the results in the Stage A, not all in the Stage B showed improvement; that is, there were some Subjects in whom learning in one field failed to radiate to another. There is a good deal of possibility that this failure in the radiation was due to the difference in the materials used; practice in 'strengthening memory' with the force of repetition may not help the individual in learning other kinds of materials.

Stage C

With regards to the materials used this stage of the investigation was radically different from the previous stages. The type of work selected now for practice was qualitatively different from the work on which the effect of radiation was to be observed.

Step 1. The apparatus was a simple design of Eye-board (Fig. 20). It consists of a square plank over which rows of metallic eyelets are fixed at varying angles from each other.

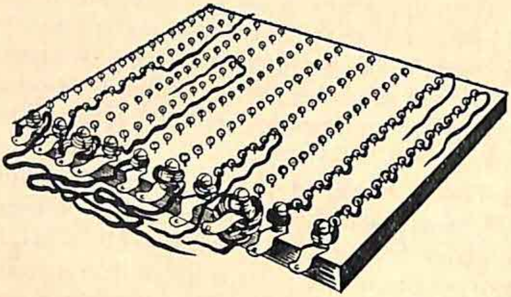

Figure 20
Diagrammatic Sketch of Eye-board.

The Subject was required to take a piece of string and pass it through one eyelet after another till the string had passed through all the eyelets in that row. Though it sounds simple the work is slightly complicated due to the fact that the eyelets do not stand face to face but are at varying angles and one has to be careful against getting entangled. Soon after one row was finished the next row was to be taken up and the procedure continued till all the strings had passed through all the eyelets. The experimenter noted down the number of errors committed and the time taken to complete the task. This was the 'control' work.

Step 2. The practice work consisted of multiplication of rather complicated nature. Record was kept of the number of correct answers in each minute. This the Subject had to practise for several days for gaining efficiency.

Step 3. The first step was repeated all over again. The result showed that none of the Subjects had improved in their performance in the eye-board test after practising in multiplication. It may be said that the results were to be expected; the materials were of such varying nature that improvement in one would not bring positive results in the other. And yet, the belief is not quite dead that those who can memorize grammar may learn as well any other subject. Even today in filling up a vacancy for a ledger keeper the employer tends to show preference for one who happened to have passed B.A. over another who had failed though none had any training in ledger keeping!

Anyway, we should now seek for a generalized hypothesis which may explain why improvement took place in one of the experiments in the above while failing in another. Evidently radiation in learning is not an accomplished fact, it does not take place in all spheres of mental or physical activity. The question which was raised at the opening of this section may now be posed anew: if radiation in learning were possible, under what circumstances may it be expected to take place?

In answer to this query Thorndike has advanced the *theory of identical elements.* If the nature of materials involved in the two cases of learning were similar, or even approached closely, or, if the same kind of mental function were implied in the two cases of learning, transfer is then possible. The effect of transfer would diminish with the materials differing from each other in quality. This is exactly what we had observed in the above experiments. Radiation in the Stage A was possible because of the similarity in the work which was practised and the one over which the effect of practice was expected to radiate. Divergence in the types of work in the Stage B caused different effect, whereas in C practice had completely failed to radiate. Thorndike's theory, however, merely attempts to generalize the observations, it fails to explain why the radiation at all occurred.

In teaching a subject, then, the teacher may not expect the knowledge acquired to be shifted automatically to other subjects; he should realize that transfer might be possible only if there were common elements in the subjects taught, and the transfer would be in proportion to the similarity in the subjects. If memorization in one subject could be improved in all probability it would benefit the pupil in learning those subjects which required similar type of memory activity, but under no circumstances it would enhance concentration of attention or the intellectual level in the pupil. Likewise, by regularly working out problems in geometry and algebra or by applying the rules in grammar and science, the pupil learns to reason better than those who had no occasion to study these subjects, but to expect that the learner would also gain in literary knowledge or proficiency in drawing would be in vain.

EXPLANATIONS OF LEARNING

Acquisition in learning is possible in one of the two ways, viz., by forming associations—the usual outcome in the repetitive acts—and by understanding the problem and gaining insight into it. In our everyday life we make use of both of these with varying emphasis on the different types of activity. In memorizing twelve words in order, it is intended to preserve them in the mind like twelve pictures each linked to the succeeding one; while recalling one if the next one failed to appear it is because of the weak link between the two. What is required is a few more repetitions and then each word would securely hold on its place in the chain.

In this section however it is intended to examine the views related to learning with reference to the problematic situations. What happens when an animal, a child, or an adult is placed in a complicated situation which may offer more than one solution, how does the organism select the right way? Why is it that placed in a similar situation in future he may stand a better chance of adaptation? What principles might be involved in this kind of learning? The different hypotheses which have been offered in answering these queries may be roughly classified into two categories.

1. "TRIAL & ERROR" LEARNING: The facts represented in the learning curves (Figs. 16, 18, 19) may be described in the following manner. The organism motivated by the rewards awaiting him strives to attain the goal. In his efforts he commits errors and fails to attain the end, renews his efforts trying now to avoid the past pitfalls but his actions do not

prove to be altogether devoid of errors, nevertheless the errors are diminished though fresh errors may crop in, and thus he proceeds till he reaches the end in view. This process of learning, though some have viewed as learning by trial and error, may however create the impression that the learner's efforts were guided more by chance than by any purposeful motivations, that the animal in the maze or the man with the problem before him leisurely took his chance resulting in either success or failure. Were it so no learning would have been possible since, as we have noted earlier, learning can not be possible without a definite desire and aim for reaching the objective. Learning process is far from being merely random actions ; the learner endeavours to establish a link between the goal to be attained and his means of reaching towards it ; this is particularly noticeable in the learning of problem-solving types of materials. The animal takes a look, finds itself in the wrong track, proceeds on a new path, maybe the new path is worse still, nevertheless it has a vague feeling that it is a correct path (or else it would not have tried at all) and when it is convinced of its errors it retraces its steps and selects a fresh one, and so on. In this respect there is not much difference between the performance of Thorndike's experimental animal or that of a child as may be observed in comparing the Figures 16 and 16(a). This process, however, is not only limited to the solving of problems but may be seen in the simplest of motor learning in which comprehension plays a minor role as, say, in typing (c.f. Figs. 18 and 19).

It would be more appropriate to describe learning as a continuous process of selecting the useful means and eliminating the useless ones. In typing we avoid those movements which stand against our raising the output just as we do in solving the problems. If there be any difference between the two it is in respect of our awareness. In solving problems in mathematics or in negotiating a maze we are conscious of our wrong directions whereas in typing we are *not so* conscious about the exact sources of errors, nevertheless, possessed with a vague awareness we do try to avoid those movements which may lead us away from the goal.

Formulating the main principles in learning Thorndike has constructed a number of hypotheses which have come to be known as laws of learning. These are however more in the nature of classified inferences and deductions obtained from experimental observations than laws in science. The basic hypotheses may be reviewed here.

(*i*) *The Law of Effect:* "When a modifiable connexion", says Thorndike, "between a situation and a response is made, and is accompanied or followed by satisfying state of affairs that connexion's strength is increased; when made and accompanied or followed by an annoying state of affairs its strength is decreased."[13] What sounds like a set of rigid legal terminologies can be stated more simply: if an act brings forth satisfaction to the learner it is retained longer than an act which causes annoyance to the oganism. By satisfaction here is not meant the pleasure experienced in the action but in attainment of the goal. An act could produce satisfaction even when the person remained in more or less passive state. Such an experience would have little effect in learning. In solving geometrical problem the pupil attacks it in more than one way, but those steps along which led to the solution would enjoy better chances of being retained in the mind than the rest which ended in blind alleys.

Looking superficially the logic of the statement appears to be sound but evidence could be produced to contradict it. Supposing the learner was not interested in the end of the act, as such but was motivated by the expectation of a reward, his success then would naturally be conditioned by the ensuing satisfaction of the reward only. On the other hand, if a serious consequence awaited the learner for failing to learn—without any corresponding reward for the success—then, too, the correct path to the solution would be retained. It is from such facts that Thorndike felt the necessity of modifying his views. From further investigations made by him and others he concluded that the effect of learning is not determined so much by satisfaction as by its *vividness.* It is the vividness of the ensuing satisfaction which is mainly responsible for learning. The learner in the last instance by avoiding the serious consequences had derived satisfaction which is vivid in comparison with what might have followed his failure. It is, then, the purpose of the act which counts more in learning. If an act may bring satisfaction by serving the final end it would produce better effects even if it caused immediate annoyance. The pupil, when he can see the relationship between his learning and his passing in the examination, would not only make directed efforts but would also get over the annoyance caused by 'not learning' immediately and would pursue his efforts. The vividness of the relationship between his learning and his passing in the examination would have greater effects than his efforts to learn and his immediate failure. Judged from this point of view McGeoch's redefining the law of effect has certain redeeming features. He says, "Other things being equal, acts leading to consequences which satisfy a motivating condition are selected and strengthened, while those leading to consequences which do not satisfy a motivating condition are eliminated."[14]

(*ii*) *The Law of Exercise:* According to this law, actions more frequently performed are retained longer. Conversely, lack of practice would lessen the effect of learning. The rote memory, or Bergson's habit memory, depends mostly on this principle. Where learning consists of memorization this law can be seen operating successfully along with, of course, the law of effect. Practice may result in perfection when the action and its consequences are properly appreciated causing satisfaction to the learner.

(*iii*) *The Law of Readiness:* Learning process can function only when the state of readiness has developed in the learner. In the absence of proper attitude or the required mental 'set' the process would fail to evoke the desired effect, not even if it were repeated. Developing the requisite attitude is a part of what has been earlier mentioned as mental preparation in learning.

2. INSIGHT: Some psychologists would like to discriminate between the two broad types of learning mentioned earlier. Rational learning they view as a complete departure from the purely associative type of learning. Existence of certain differences could not be denied if the graphical representations in this chapter were scrutinized. Motor learning (as in Fig. 19) shows no abruptness in the decline of the curve as is the characteristic feature of comprehensional learning (c.f. Figs. 16 and 16(a)). This sudden decrease in the errors, as also in the time taken to learn the task, may be noticed in the pupil's achievement. Suppose a pupil were given thirty simple sums in addition and in each there were numericals of negative value. If he did not know the principle he would commit the same error in all the sums, he would probably treat all the numbers as positive and after adding these he may deduct the total of the negative values. He might also commit mistakes of other kinds which could be eliminated by practice but not so the treatment of the positive and negative values. After doing the first fifteen sums if this fundamental mistake were pointed out to him there would now be a sharp reduction in his wrong answers. This improvement may appear to be qualitatively different from the gradual and steady improvement in his handwriting for instance. When the learner after making fruitless

attempts suddenly sees through the relationship between the goal and his efforts he is said to have gained insight into the problem. For a long time insight in psychology was treated as a mystery. If however the situation giving rise to insight were properly analyzed the mist of mystery would soon be dissolved. The solution of the problem though appears with characteristic suddenness it need not be so abrupt after all. In such cases we often ignore the value of the attempts previously made and take into account only those which were of immediate concern to the success and recognize those attempts alone which had led to the solution. Insight therefore, should be distinguished from the trial-and-error form of learning not qualitatively but quantitatively. McGeoch is nearer to truth in observing, "there is at present no clear evidence of a sharp dichotomy between trial and error and insight. Instead one merges into the other in what appears to be continuous series of learning."[15]

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CHAPTER XII

INTELLIGENCE & ITS MEASUREMENT

Asked to single out one mental asset which bore the largest share in man's success, nine in ten persons probably would answer: intelligence. This natural gift in the man is supposed to be the main prop in lifting him to a soaring height of success, by its deficiency to leave him in abysmal depths of ignorance, or mark him along with the millions who are born to live and die unknown. This is one of the prevalent misconceptions.

It is commonly observed that the individual's intellectual achievements are the products of his education. And yet, Faraday started on his career not inside any well equipped school but as an apprentice to a bookbinder. Gauss is called the prince of mathematicians; born in the family of poor farmer 'he learned reading by himself and by asking how the letters were pronounced, and even before that his power of mental arithmetic, for which he had no preparation of any kind, astonished everyone'. Laplace came from poor parentage and struggled to take up military career, but the world knows him for his extraordinary gifts in mathematics; and admittedly this is one subject in which the demands of psychological talents outweigh those of institutional education. Mendel received no training in science but it was his inherent capacity for observation that has made his name a byword in biology, and this capacity is inborn. It is this ability to observe in the proper perspective which is frequently indentified with intelligence.

The imbeciles and the idiots are the illustrations in the opposite direction. Owing to the limitations in their native intelligence these unfortunate beings remain incapacitated all through their life in performing normal intellectual activities. They could hardly aspire to derive the benefits of education. With the aid of consistent and specific training an idiot may perhaps improve to the extent of saving his life when in danger, but this improvement would be by way of exploiting the instinctive tendencies only.

Between these two extreme levels of inherited intellect there lie scattered the multitude of the normal human beings possessing varying shades of intelligence. In view of the facts that intelligence is a mental characteristic possessed by all, that it varies in quantity in the different individuals, and is very little affected by the usual educative processes, it serves useful purpose as an index to distinguish one man from another. For long, psychologists strove to locate the source which could be held primarily responsible for the individual differences in the man. They had to travel a long way before they tumbled upon the tests of intelligence and found these to be the most suitable device to serve their purpose. A glimpse of the origin of the intelligence testing movement may be found quite interesting.

A BRIEF REVIEW

In the year 1795 an incident took place in the Astrological Observatory at Greenwich which laid the foundation of psychology as an experimental science. The incident, by itself insignificant, could now be considered an event. An assistant in the observatory, whose job it was to record the time that the stars took in their passage across the thin wire attached in front of the telescope, was detected committing errors in his measurements. The magnitude of the errors though infinitesimally small could not be ignored in the astronomical measurements. The poor man had to pay dearly for what was believed to be his carelessness. The measurements were then taken by another person, with the same result! To the astonishment of the director of the observatory it was revealed that all persons made similar mistakes. Considering now this error to be inevitable it was given the name of *personal equation*. Since the individual records showed variations in their personal equation this problem drew attention of psychologists who now tried to find a clue to this perplexing phenomenon. Studies in the individual differences thus had now started.

At the outset, however, interest centred round the physical measurements, for example, height, weight, size of the skull, etc. Though these measurements failed to bring out any significant basis of individual difference they, nevertheless, aided in the collection of a large body of data for future use. The people no doubt differed in size of their head, to consider one illustration, but this physiognomical character is no reliable indicator of the problem in view. Two persons measuring the same in the size of their head, height and weight, may differ radically in their intrinsic merits and manners, behaviour and the other modes of individual expressions. Evidently then the root of the problem did not lie in the gross physical aspects of the organism.

Incidentally, it was during this period that scientists were showing growing interest in the inheritance of biological characteristics following Darwin's publication of his thesis on evolution. Francis Galton, a cousin of Charles Darwin, attempted to apply the principles of measurement then existing to the mental phenomena. He wanted to verify to what extent our psychological propensities we inherited from our forefathers. Galton's conclusions formed another corner stone in the mental testing movement to be. Numerous tests were developed for the assessment of sensation and perception, memory and attention and other psychological functions. Despite amassing of large volume of data failure awaited the investigators. These mental phenomena could not be concluded as reliable indicators of the individual variations. For, instance, men of genius may or may not possess reputable memory, and then, memory itself is not of one kind. Sincere endeavours however do not go unrewarded. Strenuous searches might lead to insignificant facts, but these ultimately may go to establish significant results later on.

These ventures paid their dividend when a French psychologists, Alfred Binet by name, was asked by the French Ministry of Public Instruction to devise a method which could be employed to discriminate quickly the dull children from the normal. He had observed, and here lay his genius, that the development of the mental characteristics bore uniform relationship with the physical development. Thereupon, he proceeded to prepare a series of tests answers to which could be given by children even without much schooling. He applied his tests to boys and girls and noted down their success and failure. Next, he compared the results of the tests with the opinion of the school teachers regarding the merit of these pupils who were well known to the teachers. He now sorted out the dull, bright and the average merited pupils and scrutinized their scores in the various tests. Curiously enough the three categories of children varied mostly and significantly in those tests which required comprehension of problem, attention and adaptation. He therefore reported, "We have implicitly admitted that attention consists in a mental adaptation to a situation new to us." And these constituted the higher mental functions which went to create the divergence among the men. Much later, Cyril Burt, the renowned

British psychologist, further clarified the position by demonstrating that the abilities of reasoning and thinking were the best indices of the individual differences in the domain of intellect.

Not thoroughly satisfied with his results Binet continued in the application of his tests and in checking the facts obtained by him. However, in 1911 was brought out the final version of the Binet tests.* The foremost characteristic of the tests is that the person being tested is offered every possible facility to express his natural abilities, practically all the mental functions coming into play in the individual's performance on the tests. The results of the tests not only showed how far could he understand, reason and think, but how much could he memorize—digits, words and sentences, the extent of his vocabulary in comparison with others, his ability to draw, read and write, etc. A few samples of the test materials are given below.

Age VI: 1. Distinguishes morning and afternoon.
3. Copies the drawing of diamond.
4. Counts 13 coins.
Age X: 1. Arranges five boxes in order of weight.
2. Copies two designs from memory.
5. Uses three words in two sentences.
Age XV: 1. Repeats seven digits.
2. Finds three rhymes for a given word.
4. Interprets given pictures.
5. Explains problem questions.

For each age a definite number of tests were allotted. If the person passed all the tests belonging to a certain age he could be assumed to have matured intellectually to that extent. The maximum number of his correct responses would finally determine his intellectual attainment. If a boy answered all the tests up to the seventh year but none beyond that he was said to possess the *mental age* of seven years irrespective of his chronological age. This conception of mental age was a startingly new contribution towards the progress of psycological measurements. The Mental Age, or the M.A., thus turned out to be a useful tool to discern the capabilities among the individuals.

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* In his earlier years Theodore Simon had collaborated with Binet and so the scale is also known as Binet-Simon Scale.

Binet had now a *scale of intelligence tests.* A measuring device to be used as a standard must have equal units spread over a length just as a foot-rule possesses twelve equal units. His test scale had its units of one year.

This index of M.A., however, required further improvement. As it may be seen, significance of the M.A. could be understood only if it were compared with the Chronological Age, or the C.A. The M.A. of 7 Yrs did not mean the same in the case of two boys—one 6 Yrs old and another of 8 Yrs. Both possessing the M.A. of 7 Yrs the boy whose C.A. was 6 Yrs is certainly brighter than the 8 Yr old boy. It is only in the background of the C.A. that the significance of the M.A. can be properly recognized.

In order to avoid the necessity for using the C.A. every time the M.A. was mentioned, a technique was later evolved by the American psychologist William Stern. He found that the ratio between one's M.A. and C.A. gave a more reliable picture of his intellectual attainment with the additional advantage that the value thus derived could be compared with similar values obtained in others. This ratio was called *Intelligence Quotient* or simply the I.Q. Three seven year old boys if possessed the respective M.A. of 6, 7 and 8 Years could now be said to have Intelligence Quotients of 6/7 or 0.85, 7/7 or 1.00, and 8/7 or 1.14. To avoid the decimals the values of the I.Q. are multiplied by 100. Thus the three values would be transformed into the round numbers of 85, 100 and 114. This indeed is a very convenient method of judging the relative brightness among the pupils.

The tests originally devised by Binet were widely used in the USA after introducing in them the necessary modifications to suit American conditions. The technical process involved in making such alterations is called *standardization,* and it is essential before the tests could be used in a country lingually and culturally different. The reasons are simple. In one of the original Binet tests, for example, the testee is required to differentiate between the various French coins; but this test used in its original form would be useless for the American or the English people. The name of the coin has to be changed and the coins prevalent in that country are to be used. But it has to be determined as to which American coin is frequently used in the USA as the particular coin in France. The best revision of the Binet tests in the USA was prepared by Lewis Terman of the Stanford University, and this revised version is known as Terman Revision or the Stanford Tests. The tests were likewise revised for the use of British children by Cyril Burt and are known there as the Burt Revision of the Binet tests.

TYPES OF INTELLIGENCE TESTS

In view of the fact that the Binet scale is based on the use of language, its use is limited among those only who can understand the language. Even if the technicalities for standardization were going through and the scale were made suitable for using among the Hindi speaking people, for instance, it could not be applied to the Gujerati or the Tamil speaking people. Neither would it serve any purpose to the deaf-mute or the illiterate. In order to overcome such drawbacks inherent in the *language tests* other methods had to be evolved. Non-language tests now prevalent are of two kinds: those which required the use of paper and pencil, and those which did not, the latter being known as *performance* tests. An example of the non-language paper-pencil type of tests can be found in the Porteus-Maze tests, or the Oxton Group Intelligence Tests. The former consists of a series of drawings of maze ranging from simple to complex patterns each standardized for a specific age group (Fig. 21). The testee here is required to trace the way out of the maze and scores are awarded according to the number of errors made and the time taken in completing the task. The Oxton Group Intelligence Tests consist of a number of drawings in each sub-test. In the first group of sub-tests, for example, there are twenty sets of pictorial drawings. In each again there are five to nine pictures representing many objects. According to the clearly stated directions the Subject is to observe the nature of the picture at the centre and connect it with a pencil mark with the two other drawings which bear

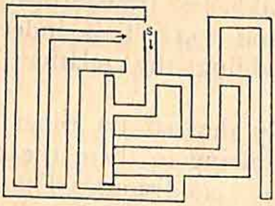

FIGURE 21
SAMPLE OF PORTEUS MAZE TESTS. THIS PARTICULAR DESIGN IS INTENDED FOR YEAR X.

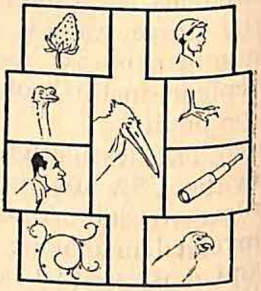

FIGURE 22
SAMPLE OF OXTON GROUP INTELLIGENCE TEST.

the most conspicuous similarity with the central picture (Fig. 22.)

In spite of their simple nature these tests presume the testee's familiarity with the use of paper and pencil. Performance tests eliminate the usage of these materials. Most of the tests in this category require manipulation of certain articles which could be done even by those who are illiterate. Form-boards constitute the most popular type of performance test materials. Each form-board consists of a rectangular wooden board with certain forms carved out of the body (Fig. 23) The pieces to fit in are randomly placed before the Subject and the time to fill up the holes is recorded along with the number of mistakes that he may commit.

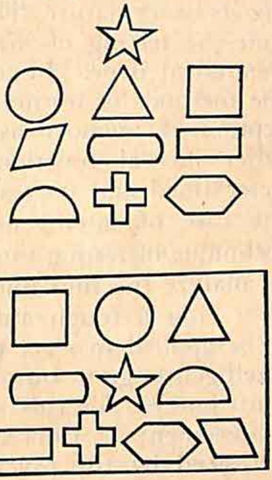

FIGURE 23
DIAGRAMMATIC SKETCH OF
SEGUIN FORM-BOARD

Most of the tests mentioned in the above are suited for testing individual persons only. From this point of view the Oxton Group Intelligence Test enjoys an advantage over the others since it can be used on a number of persons simultaneously. In the *group tests* the Subjects are supplied with the materials and the tester then reads out the direction after which the testees commence their work. The disadvantage of the group tests lies in the fact that it is not possible here to give any individual attention to the Subjects' discomfiture or difficulties which some may encounter. Unaccustomed, many feel shy and timid, or some may feel embarrassed to work in a group without mental restraint. Nevertheless, psychologically, the group tests are more often recommended for the school children because it is in the group that they have to work and usually express themselves better.

During the first world war a great need was felt for some sort of a device which could hasten the selection of recruits in large numbers at a time. It was for this purpose that the Army Alpha Test was prepared and standardized. Since the army authorities in the USA had also to face the problem of selecting recruits from the non-English speaking population as also from among the illiterates, another series of tests, the Army Beta, came into existence. While the former is based on the use of language the Army Beta consists only of pictorial diagrams.

WHAT IS INTELLIGENCE?

Following Binet's technique of testing intelligence a world-wide interest in intelligence test began to be envinced. Everywhere there sprang up novel methods, and new appliances came into use. Comparatively little attention was, however, paid to define intelligence, and still less in determining its exact nature. This is understandable if we remembered that the testing of intelligence was not the sequence of any theoretical issue. In testing memory, for instance, it was not the methods of testing which had appeared first, but the conception of memory as a psychological entity different from other mental functions. The nature of memory was first determined and its testing procedure followed thereafter. In the case of intelligence testing reverse was the case. The technique of testing intelligence had evolved from the attempts to analyze the fundamentals in the individlual difference, and, soon after a rough and ready method was available it came to be applied to serve practical ends. Even Binet's interest in intelligence grew out of practical needs and his theoretical contribution towards this subject never excelled practical achievements.* Consequently, the definitions of intelligence as advanced by the psychologists in general were rather vague and hypothetical mostly because of their inclination to rely more upon logical analysis of limited amount of facts than on actual and exhaustive psychological findings. We may examine some of the definitions here.

Ebbinghaus believed intelligence as "the ability to combine and integrate" parts of ideas into wholes. In the completion tests, for example, parts of a sentence were left blank which were to be filled up. Here is an illustration:

Fill up the blanks:

(*i*) Snakes — harm if unmolested.

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* To recall parallel instances in the physical sciences mention may be made of heat and electricity. The measuring techniques in heat and electricity had evolved long before we possessed any clear idea regarding their nature. In the use of the thermometer as a heat measuring device the practical ingenuity of the investor superseded his theoretical knowledge. In using a thermometer we do not directly measure heat but the expansion of mercury when heat was applied to it, the degree of heat is recorded only by inference.

(*ii*) Moon being too — it is believed that — there is — possible.

The Subject's success here depended on his understanding the underlying meaning of the parts and then moving a step further in their integration with the whole. Judging the definition critically one might as well inquire how then intelligence differed from reasoning and thinking. Binet has described intelligence as "judgement or common-sense, initiative, the ability to adapt." Stern: "Intelligence is the ability of the organism to adjust itself to new situations". Burt: "It is the power of readjustment to relatively novel situation by the organizing of new psychological combinations." Terman: "An individual is intelligent in proportion as he is capable of carrying on abstract thinking." In these definitions one may notice certain intrinsic similarities, viz., that intelligence has been universally accepted as an innate mental trait, and, it is related more to the higher mental functions than to, say, sensory or perceptual processes. Intelligence of a person is the sum total of his higher mental activities. Nevertheless, these definitions are more descriptive and exploratory than explanatory.

In the above has not been included one definition, viz., the one offered by Spearman which is the outcome of investigations on the theoretical nature of intelligence and thus the first of its kind. In his definition Spearman simply desired to give expression to his actual findings. It can be broadly divided into the following parts viz., (*i*) the ability to discover the essential relations between objects and ideas, and, (*ii*) the ability to educe correlates when the relation was known. In the following illustration, "SNOW is to COLD as FIRE is to—" the reader has first to discover the relationship between SNOW and COLD. It is this understanding when correctly applied to the next part of the statement would result in the correlate HEAT. Correlate here means that which is related to the given fact. What could be related to FIRE? There could be many things like red, fuel, warmth, burn etc. But to pick up the requisite idea one had first to understand the relationship between SNOW and COLD. The extent to which one could see this relation correctly and quickly and to apply it to other conditions would depend upon the native intelligence that he possessed.

This mental ability Spearman contends is not marked equally in all kinds of actions. A renowned scientist or an erudite philosopher with all his knowledge may fail to draw a simple diagram or sketch neatly as an ordinary artist would do. Why this anomaly? Partly of course this failure may be attributed to training, but only partly. Spearman explains that the success in the performance of an individual may depend on two mental factors. Firstly, a general mental factor of the performer which shows itself in nearly every kind of activity, and secondly, a specific factor required in that particular type of task. Spearman declines the use of the word intelligence in this connection since he feels that the word intelligence 'has so many meanings that finally it has none'. But in using the term it is to be understood he meant what is commonly meant, intelligence is 'common-sense'.

For a better appreciation of his arguments we may have recourse to a simple statistical device known as *coefficient of correlation*. If twenty boys were required to write two essays there would be every likelihood of a pupil who did well in one doing as well in the second. If the same pupils were next tested in drawing we might fail to find the same relation between the marks in essay writing and drawing. One would not be astonished to see the pupil who stood first in essay writing now taking a low rank in drawing. Under such circumstances one would rather seek for some method which could explain in a simple manner how far the marks in two tasks were related together. Coefficient of correlation (or r) is a single numerical value varying between 1 and -1 depicting such relation.* Seldom, however, one would get such perfect values as 1 or -1. Nevertheless, a high positive r would justify our inference that a very similar kind of mental operation was required in peforming the two tasks. It is for this reason that the marks in the two essays correlated highly. A low correlation on the other hand would indicate that despite a certain amount of similarity in the tasks these were of divergent nature, and so the persons who did well in one failed to succeed to that extent in the other. If, however, the coefficient of correlation between the marks in essay writing and drawing showed a negative value we could infer that the type of mental work required in the one was definitely not needed in the other. Anyway, it is in very few cases that we come across tasks which required mental functioning of diametrically opposite nature, not at any rate in the school subjects. Incidentally, this observation cuts across the common belief that the boy who is not good in mental work would prove to be good in manual type of work. Contrary to this *theory of compensation* it is now held that one who is good in one kind of work, given opportunity, would prove his capability in another as well. If the renowned scholar in science was not good in drawing he would be much better than the average provided he were given some training.

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* For the method of computation see the last chapter.

Spearman held that all cognitive activities are intrinsically similar to each other in proportion to the cognitive function of the mind which is brought into play. At the same time, they are dissimilar because of each calling for certain specific kind of mental function. Cognition, for example, is essential in understanding problems in mathematics, logic, interpretation of history, evaluation of art and architecture, comprehension of language, etc. The part of mind which is manifested in all these mental operations may be represented by 'g' in the Fig. 24, whereas the ability to remember numericals in mathematics, use of language in logic, drawing designs in engineering are the specific functions represented by the symbols 's', specific to each task in a particular way. A man possessing high degree of 'g' may solve problems in mathematics making mistakes in counting here and there, whereas there have been known cases of such persons who despite their phenomenal memory in numbers enabling them to mentally multiply four figures by four figures fail to rise above the average level of intelligence. This anomaly could be explained if we saw that the power for such numerical feats is very little dependent upon the general intelligence. It may be enquired as to how Spearman arrived at the conclusion regarding the 'g' and 's' factors in intelligence.

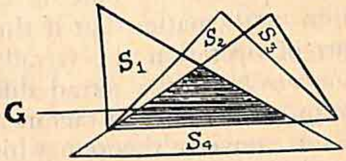

FIGURE 24
DIAGRAMMATIC REPRESENTATION OF MENTAL FACTORS.

Almost all the tests requiring cognitive elements he found to correlate highly among themselves. Using statistical language, such tests showed positive and often higher r ; whereas tests supposedly measuring the factors of 'g' and 's' with an emphasis on the latter failed to reveal any high positive correlation.

There is another aspect of his theory in which he was very much guided by pure mathematics. The following table, for instance, shows the intercorrelations between several tests applied to a group of persons.

TABLE 4

	(*a*)	(*b*)	(*c*)	(*d*)
Arithmetic Test (*a*)	—	.48	.24	.27
Picture Test (*b*)	.48	—	.40	.45
Analogies Test (*c*)	.24	.40	—	.27
Cross-out Test (*d*)	.27	.45	.27	—

Closely observed, these correlations would reveal an interesting relationship. If the block of correlation $\begin{array}{|c|c|} 24 & 27 \\ \hline 40 & 45 \end{array}$ were cross-multiplied, the products would be equal to 0, $(24 \times 45) = (40 \times 27)$. Using simple algebra $(24 \times 45) - (40 \times 27) = 0$. This remainder is called the *tetrad difference*, and the square block of four correlations, the *tetrad*. Using different tetrads in such tables in which the intercorrelations of larger number of tests were given Spearnman observed similar results. Thus far he relied on mere factual evidence. For the next stage of his theory he had to rely purely on mathematical deductions in which psychology had no contributions to make. We learn from mathematics that if there be two factors inherent in any sort of operation the tetrad difference will be equal to zero. *Conversely*, if the tetrad difference proved to be zero it may be inferred that two factors were implied in the operation. It is this converse theorem which Spearman profitably applied in psychology. And thus, the theory has come to be known as the *two-factor theory* of intelligence.

TECHNIQUE OF TEST CONSTRUCTION

From the folk-tales one may gather how popular once were the conundrums. The kings and the lords made free use of the riddles to make their choice of the public servants. But riddles are riddles by virtue of their ambiguity, and this is one shortcoming of which the present day mental tests could not be blamed. On the contrary, the tests to be of any use must pass through a number of technical processes and satisfy the requirements of standardization. These are as follows.

(1) *Validity*

Any scale, or the units of measurement, to be applicable must be valid for the purpose, one does not use lbs as units for measuring length. The principle of validity is the fundamental criterion according to which a test scale could be judged. In the construction of the intelligence tests it should be seen that the materials used measured intelligence and not any other mental phenomenon. But there is no single way through with intelligence is manifested. Every form of cognitive-conative expression partially exposes the individual's intelligence. Vocabulary and drawing, memory and writing, reasoning and thinking, enumeration and manual performance, the capacities to learn and to discern, are some of the channels through which one expresses himself and each of these action patterns bears the stamp of the individual's intellectual calibre. Though all these modes of expression are jointly considered for assessing the intelligence any of these taken separately would fail to serve the purpose. Evidently then, the larger the number of test items embodying every possible ways of expressing one's ability to see the relationship and educe correlates the more valid would be the scale for our purpose.

(2) *Reliability*

If a block of camphor were used as a weight, an article weighed with it today would appear to grow heavier after a fortnight. Consequences of unreliability would be no less serious if a mental test showed discripancies when it was repeated. The criterion of reliability in test performance is judged by the stability in the test results obtained even after a sufficient length of time. It may be argued that one's mental age would change after an interval of a year, but then, so would be his chronological age, consequently the I.Q. would remain unaltered. Judged from the point of view of reliability the Binet-scale offers the best evaluation.

(3) *Objectivity*

The unambiguous nature of the questions set in the mental tests, together with the inflexibility of the expected answers leave no scope for obscurity in the testee's responses. This advantage is considerable indeed when we compare the situation arising in the ordinary examinations. There the pupil has plenty of opportunities in influencing the examiner's judgement, for instance through his neatness and handwriting which are quite besides the main issue of examinations ; again, in writing an essay the examinee may beat in the bush without giving a straight answer. Besides, in judging the answer scripts the different examiners may not form the same opinion with the result that marks awarded in an answer script by different teachers vary more often than not.

In constructing the tests due precautions are observed against any subjective influence of the scorer. No matter who scored the test responses, provided the directions were strictly adhered to, the tester's personal opinion should not affect the scores. Here lies the importance of *objectivity* in the present system of testing. An illustration is given here.[1]

"Repeating 5 Digits

> Procedure: Say, "I am going to say some numbers and when I have finished I want you to repeat them just as I do. Listen carefully, and get them just right." Before each series repeat, "Listen carefully, and get them just right." Pronounce the digits distinctly and with perfectly uniform emphasis at the rate of one per second.
>
> (*a*) 3—1—8—5—9, (*b*) 4—8—3—7—2,
> (*c*) 9—6—1—8—3.
>
> Score: 1 plus. The series must be repeated in correct order without error after a single reading."

Attention here is specially drawn to the rigid method of giving directions preceding the actual tests. The tester is not free to introduce *any* change in the rules laid down in the directions to be given, administration of the test, or in its scoring; and the objectivity thus maintained is neither possible in the conundrums nor in the ordinary examinations.

(4) It is, however, enough that the tests for use should be free from these technical shortcomings. There are some practical aspects too to be reckoned with. Suitability of a test would also be judged according to the *ease with which it can be used*. A test scale which may take 3 or 4 hours to complete could hardly be expected to be of any use outside experimental purpose. It is true that the validity of a test largely depends upon the number of test items, but too long a test scale eventually would rob the testee of his interest and this would adversely affect the scores.

(5) *Norm*

In every kind of measurement there is a standard in use. In the measurement of length the meter or foot may serve as the standard against which a space is measured, so in weight and time. Mental measurement could be no exception. The problem is: what standard to adopt? In selecting test materials what criterion is to be followed? How to find out whether the test material is not too difficult or too lenient?

Suppose 20 questions were prepared and administered to 100 boys and girls aged nine years presuming that these Subjects represented a random sample of the population, i.e., they included bright, dull, and average merited persons who came from poorer homes as also of well to do classes, literate and illiterate, the group then would be a representative one for nine-year old children. Suppose further, eight of the twenty problems were correctly answered by the 50% of the Subjects, five by about 25% and seven by 80% of them. It has to be accepted that the five questions were too difficult and the seven too easy. The eight problems truly represented the mental level of the group. If another boy, not belonging to this group, correctly responded to these eight tests items he could be said to have attained the average intellectual level of the nine-year-old. Suitable tests could likewise be devised for each age group, and these selected tests then would be considered the correct standard, or better, would represent the norm for this scale. *Norm* is the representative value of a group, the level of attainment actually arrived at, whereas standard is the level of attainment which is desired.

In deriving the norm, as explained in the above, boys and girls of the same age were tested. The scores obtained were typical for a child of that age. Such norms where the chronological age is the key factor in judging the mental development are called *age-norms*. In other cases, mostly in the educational tests, the standard or the grade is more frequently used as the criterion for testing the improvement. These are called *grade-norms*. So, there can be various types of norms, e.g., *sex-norms* (the test here would be applicable only to that particular sex for which it was prepared), *race-norms*, etc. The Terman Revision of the Binet-Simon tests are restricted in their use only to the white population in the USA since the samples used for standardizing the scale were taken only from the white population. In a way, therefore, the norm here is also a race-norm besides being age-norm.

GROWTH AND THE LIMIT

The physical growth of the child is most rapid during the early years of childhood. The changes in its adaptability appearing during this period is astonishing; this rate declines with the age. The same law is applicable to the child's mental growth. Lower the age greater is the acceleration in the development, that is to say, with the progressive increase in the chronological age the mental growth continues to slow down.

Nevertheless, the development continues till the seventeenth year after which any improvement, if there be any, is almost negligible. It may be pointed out that intelligence as an innate trait ceases to grow at this age, or near about, but the individual continues to gain from his experience. In other words if the native intelligence in the man constituted the vertical level in his 'cleverness', its horizontal level will constitute his experience in the life. Psychologically, therefore, the man may grow "heavier" after the sixteenth year but there is little likelihood of his growing "taller".

USE OF INTELLIGENCE TESTS

(*i*) It is a common practice in the schools to examine the entrants in language and elementary arithmetic. Such a test is made to find out which grade may be suitable for his admission. Once the pupil has been properly placed according to his ability, it is believed that, homogeneity of the class would be maintained thereafter helping in the class teaching. Otherwise, a bright child would feel bored if the class progress were slow, whereas a dullard would get exasperated if the teacher proceeded rapidly. The necessity for a class of homogeneous intellectual level is thus understandable but the method usually employed is questionable. At the beginning of the session the class would no doubt maintain intellectual uniformity, but by the end of the session the bright would have learnt more than the dull and once more the class would become heterogeneous in character.

The problem of forming a class of homogeneous intellectual character could not be solved by such a preliminary examination. The teacher should better enquire how much the pupil was *capable of learning* than how much he had *actually learnt.* It is the inherent intellectual ability in the pupil that counts in maintaining the homogeneity of the class. This ability can best be examined with the aid of intelligence tests, the scores would indicate the possibilities of his future standing in the class and his ability to learn. The tests could also be used for classifying the students for different sections in the same class. Intelligence tests, then, are useful tools for the *classification* of the pupils.

(*ii*) Promotion of the pupils to the higher class at the end of the term is another way of regrouping the pupils. This regrouping is usually based on the results of the terminal examinations. Apart from the fact that the present system of examinations is not thoroughly reliable it has to be admitted that the intelligence tests enjoy an advantage of their own. Used along with the routine examinations intelligence tests could inform us whether the pupil has done justice to himself. 50 marks gained by a student of 120 I.Q. is not the same as by one with 90 I.Q. The former had possibilities of showing better performance, either he did not make serious efforts or there was something wrong in the teaching methods. The intelligence tests therefore are useful adjuncts in *assessing pupil's potentialities.*

(*iii*) Results of intelligence tests give us a hint regarding the future career suitable for the pupil. As it is well known every vocation requires a minimum of intelligence. For a successful career of a medical student for instance one must possess an amount of intelligence above the average, and much above that required in skilled labour. Intelligence tests then can be used as an aid in the *selection* of vocation.

(*iv*) To a student of pedagogy it will be evident that the method of teaching could not be a stereotyped one for all kinds of pupils. What may be considered as correct pedagogical method for the bright would prove to be injurious to the mentally retarded, or even the average. Individually used intelligence tests could serve the purpose of *prediction* of the pupil's future progress.

LIMITATIONS OF INTELLIGENCE TESTING

There has grown a tendency to treat the results of intelligence testing as intellectual blue-ribon. This has obviously grown out of the belief that intelligence stands isolated from the rest of the mental functions, that it is altogether unalterable, and that it stands supreme for any success in the life. Investigations of the late have given ample indications to the effect that not only the environment of the testee has its repurcussions on the intellectual field but the results are variable to the extent of 25-30 points. Evidently then, we have to wait for a more comprehensive study of the fundamentals of intelligence and till then we should view the results of intelligence testing with caution. Again, the tests reveal the general intelligence in the pupil ; they do not tell us anything about the testee's emotional life, his aptitudes and special abilities that there may be, and these ultimately count in one's success in life when looked at in its broader perspective.

REFERENCE

[1] Measuring Intelligence—Terman, L. M., and Merrill, M. A. Form L ; Age, VII Year, 6th test.

CHAPTER XIII

THE RELIGIONS OF THE MIND

CONSCIOUS AND THE SUBCONSCIOUS MIND

"I know my mind", "None could know about myself more than I do" . . . . Such figures of speech lead to the inference that mind and awareness could be held as synonymous. If mind were really equivalent to consciousness we should be aware of all that is credited to mental action. But are we? A few illustrations will make the matter clear.

(*i*) While engaged in some routine work as, for instance, in making preparations for going to college, a vague feeling sometimes creeps in the mind that something is missing, something which ought to have been done has been left out. Unable to spot out the deficiency we may proceed towards the destination, and just before reaching the college it comes to the mind that the note which was promised to a student has been left at home. That is to say, what had now become conscious was not at the conscious level a few minutes earlier. Where was this awareness before it became conscious? The idea certainly was *in* the mind though *out* of the orbit of awareness. It may now be questioned, what part of the mind, if mind was at all divisible, could be held responsible for holding back the idea from becoming conscious.

(*ii*) Different is the case of definite forgetting, which is a common phenomenon in our everyday life. With our best efforts sometimes we are unable to recall the name or face of a person or the place of an incident we had once witnessed though we may be able to do so a while later. What happened to these experiences prior to their appearing in the conscious state? How could be explained this reappearance in the mind of what was definitely forgotten?

(*iii*) Faced with a problem defying every attempt to solve it, a man may turn to give his mind some rest. Somewhere in the night he may wake up with the much desired solution dazzling before his mind. Cases are not rare when poems were composed in sleep and the solution of a problem arrived at. We may ascribe these achievements to the refreshed mind. In that case a renewed attention to the problem would be needed, but the problem was factually solved during sleep when the mind was at rest. This kind of a strange situation could be explained only if we believed that some part of the mind was active when the rest remained inactive.

(*iv*) A person under the influence of hypnosis (which is not a conscious state) may be suggested by the hypnotiser to perform an act on regaining consciousness. In carrying out this suggestion in his dehypnotised state the person is not at all aware of having received the previous instructions. As a matter of fact, he may mechanically perform the action in obedience to an unknown command. How did he carry out the instructions which were given in his unconscious state?

(*v*) In certain extreme forms of mental abnormalities (e.g., in aphasia) the person may totally forget his name, residence and everything connected with himself. Later on, reminiscene may gradually dawn upon him and afterwards he would completely forget all about the aphasiac state. Now, on reverting to the normal state he would be able to recall all about himself as they were in the pre-aphasiac state. What had happened to his awareness during the aphasiac state?

From the above facts the following inferences could be made.

(*a*) Awareness or consciousness is only a part of the mind, it is not synonymous with the mind. It is possible for the mind to function without ourselves being aware of its total functioning. While remaining aware of the partial operations of the mind we remain ignorant of the rest (c.f. i and ii in the above).

(*b*) It is possible for our actions to be guided not by the conscious part of the mind but by something beyond that (c.f. iii and iv in the above).

(*c*) In view of what was previously forgotten or remained vaguely conscious and later became clearly conscious, we may conclude that all that of which we remained temporarily unconscious must have remained concealed somewhere in the mind. We are not conscious of this part of the mind. Though mind is not physically divisible we could distinguish this region as the *subconscious* part.

(*d*) Our actions are not always motivated by mind's conscious functioning. Usually we do act according to our conscious desires but there are occasions when our actions could be explained only if we believed in the influence of a powerful subconscious mind.

> It may now be recounted that mind is not synonymous with awareness, that it possesses dual functions—conscious and unconscious, and that each of these is a guiding force behind our activities.

The subconscious is a mental storehouse wherein we lay down the ideas presently not needed, these could be conjured back to the consciousness as and when the need arose. It also holds back our anti-social desires which we repudiate and wish to forget; yet, the monsters ceaselessly endeavour to emerge and gain possession of the realm of our consciousness.

This knowledge of the mental schema we owe mainly to the psychoanalytical doctrine, the school of thought which invites our attention to the depths of the subconscious mind for a proper understanding of our behaviour. It is interesting to note that the chief propounders of this school, viz., Freud, Jung and Adler, have all derived their knowledge regarding the subconscious mind through the studies in the abnormal mental states like insanity and neuroses. Usually though these three names are referred as belonging to the 'psychoanalytical school', it may be added that the similarities in their views hardly go beyond their unanimous acceptance of the concept of the subconscious mind and its importance in the life of man. At places divergencies in their theories are broad and acute, but we are not concerned here with the details of their theories. We will examine only those original issues with which their names are associated.

FREUD: According to this founder of the psychoanalytical school, the newborn babe, like a lowly animal, starts his life with many desires to satisfy but without any knowledge of good or evil. The child is an amoral being. In Freudian language, it is guided by the *pleasure principle* and seeks to avoid what is painful to it. The infant considers it to be but natural that it should do what it liked and get what it needed, and the world it believes to move in the orbit of its desires—the desires which in the future would take the shape of sexual desires. This energy that the child expresses in its desires is known as *libido*. At this early stage the infant is unable to distinguish between itself and the world outside. This mental state is given the name of *Id*. The primordial instincts are believed to have originated from this Id. Later on as the child grows it comes across realities in life and finds obstructions and hindrances against the fulfilment of its desires, and these pain it and give it a mental jolt, but there is no escape from the realities. When hungry it devours the food in its infancy like animals; it has now to modify its behaviour. Uninhibited in its desires, previously it played with its excreta, this it now finds to be one of the forbidden acts, and such forbidden acts it has to encounter in every sphere of life. However, its mind gradually gets adjusted to the environment and it comes to accept the inevitable, though not *in toto*. The part of the *Id* which gets acclimatized to the realities is called the *Ego*. The *ego* may be compared to the low-born criminal who on getting accustomed to live in a more decent surroundings becomes a part of it and himself may now frown upon criminal activities, and if it cannot avoid the old ruffians tries to avoid, ignore and forget them. The *ego* now begins to disagree with the *id* and its desires, though the latter continue to occupy a larger part of the unconscious region of the mind. The subconscious mental region, according to Freud, consists of more than one stratum: the deepest one he has termed as the *unconscious*. This *unconscious* is not prepared to reveal itself without suitable technical devices as employed in psychoanalysis. The *id*, however, does not remain quiet and passive, it continually exerts its force. Since it finds any direct access to the conscious region blocked by the *ego*, it has to adopt indirect means, as in dreams, wherein the individual fulfils many such desires which were not allowed to arise in the conscious mind due to the social prohibitions. In brief, life is a series of conflicts between the *ego* and the *id*; the devious mechanisms employed and the outcome of these conflicts we shall examine later on.

JUNG: It is with regards to the nature and functions of the libido that Jung disagreed with Freud. According to the Freudian conception libido is the storehouse of our mental energy; most of our actions, if not all, are directed by the libidinous energy of sexual nature. Jung held that it is the *will to live* which is the main plank of the libido driving us to actions. Man is constantly engaged in fighting out the adverse circumstances which threaten his existence. The conflict, for Jung, originates not in the realm of sex but in its efforts for survival.

ADLER: Adler's fundamental contribution to the psychoanalytical theories is his doctrine of *compensation*. He holds that man is always conscious of his inherent weakness and realizes it in proportion to his weakness in whatever sphere of living he may be placed. He endeavours to compensate for this weakness consciously or unconsciously, and this struggle is the root of his mental conflicts. Since the individual is not always capable of achieving what he wanted, in addition to its growing sense of inferiority, he strives to attain superiority in some other directions. Our actions are the resultant effects of these warring forces.

We, then, do not know our mind, not always at any rate. Any attempt to analyze the motivating forces behind our actions would fail if our explorations were restricted to the conscious surface only. The need propels man to action, but this drive is not always conscious. For a comprehensive analysis of the situation in which man acts we have also to take into account the urges arising in the realm of the subconscious mind. A few illustrations may make the position clear.

Saving money for the 'rainy days' can be understood but the actions of the man remain obscure who accepts privations to amass wealth and derives the greatest satisfaction only in gazing at the pile of bank notes or at the growing figures of his bank balance. Again, is it agreed that social progress depends on the acceptance and following of the moral codes: but, the blushing and stuttering of the young puritan at the very sight of a girl could not be explained thereby. Another case—a boy who had awaited eagerly along with his playmates for the opening date of a much advertized movie found himself in a great dilemma as his mother fell ill on the day the show was to commence. He was disappointed, but his temptations soon lost their resistance by the persuasions of his friends. He took his share of sufferance at the booking counter and came out of the crushing throng with a ticket and half of his shirt. In due time he entered the auditorium in the company of his friends; soon after the picture started, however, he began to fidget. Barely half-an-hour had passed when he apologized to his friends who were absorbed in witnessing the film and returned home. Back home while attending his mother he recurrently felt the pang of his hasty decision all over again.

Of the three cases mentioned above the last one is the easiest to explain. The young lad was torn between two opposing forces of desires: to satisfy his conscious longing to enjoy himself and the semi-conscious pull of the moral conscience in the opposite direction. The former gained in strength when persuasions came from his friends and the opposing force lost its strength temporarily. As he entered the 'house' he partially met satisfaction and his longing lost part of its own force—which meant that his moral conscience comparatively grew in its strength and was now stronger in the absence of his friends' pleadings. On going back home he felt some satisfaction and the feeling of guilt was partly dissolved, his old desire to please himself grew in its force, though it had lost its previous intensity, bringing in him the feeling of repentance.

The adolescent who felt not at ease before a member of the opposite sex provides a case slightly more complicated. The individual might in some way be actually inferior to the other person. Or, it may be that the situation had created a conflict in his mind, a conflict between the desire to enjoy the present company and the cobweb of his earlier fantacies spun in the connexion with a member of the opposite sex. Since the latter relationship at this age is not permitted to grow in our society, and since an exaggerated moral woe is usually attached even to the thoughts of such a relationship, the boy approaches the girl with an exaggerated feeling of guilt. It is this conflict charged with emotion which throws him off the balance and robs the command over himself in normal speech and action.

The case of the miser is much more complex. It is evident that his saving the pies by hook or crook while denying himself every reasonable comfort is not consistent with the needs. His actions could not be explained by way of plausible conscious motivations. Some unconscious factor was responsible for driving him to increase his wealth accumulation of which was a pleasure in itself.

From such case studies we may conclude that, (*i*) our needs are not always born in the conscious field ; (*ii*) the needs may result from the varying categories of social demands and individual yearnings, and that, (*iii*) each person has his own way of adjusting himself to a situation.

Out of these conclusions the first one is of greater consequence to the psychoanalysts and experimental psychologists. It is of less concern to the teacher or the student of educational psychology whether the desire or the need had its origin in the conscious or the unconscious mind ; he is more concerned with the process of adjustment that the pupil may make under different situations. Since the pupil's behaviour is the main index of his mental state it is of interest to the teacher to know in what different ways the pupil may adjust himself, and, under what possible circumstances. If possible, the teacher should also, help in correcting the pupil's adjustment* when faced with a conflicting situation.

Before examining the ways of adjustment we may look for the basic needs of the conscious and the subconscious mind. A comprehensive list is not what we intend to draw here nor would it be possible. But there are certain fundamental urges of the mind of which the child may be conscious, vaguely conscious, or unconscious, but to ignore which would be to invite unhappiness.

THE BASIC MENTAL NEEDS

The child is in dire need of *love and affection.* It is a pathetic life indeed if the child has to live amidst the surroundings in which love finds no echo.† Nothing hurts him more and stultifies his normal reactions than when the child felt that there was none to love him and he had none to love. And to think of it, how simple it is to satisfy this desire. Where a wealth of presents may fail to evoke the response in him, a congenial smile or a hug would work like open-sesame in him. The great importance of love and affection in the childhood days may be gauged from the fact that starved of this emotional nourishment the child may grow healthy with age but crippled mentally. Further, man's life is a continuity ; the life of childhood is not isolated from the later life of the adult. If deficiency in diet may leave indelible marks upon his physical growth and development so could the deficiency in mental nourishment with perhaps worse after-effects. The requirements of love and affection when duly met at the younger stage ensure a balanced mental life in the man as he grows.

Next in importance is *social recognition.* The value of reward as a motivation in learning is universally accepted ; and, social recognition is the most significant reward in the life of man. But never he hankers after this prize as in his childhood. It would be appropriate to say that a leader is not born but made by the society. It is true that the leader to be accepted as such must possess certain inherent qualities but history does not lack in instances of leaders losing their leadership with the adherents' withdrawal of recognition. It requires courage indeed to ignore social recognition and stand by one's faith in what he considers right. Such men leave this world as Galelios and Gandhis, but social recognition to a common man is his guiding star. It may be added that parents' love and affection however abounding at home cannot chain the child to the four walls of the house. He must go out in his group and gang in quest of the next objective in his life, *viz.*, recognition from his own society.

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* The active progress of *adjustment* should be distinguished from the passive state of *adaptation.* The latter represents the situation when the individual enforces himself to the situation even if he disliked it ; whereas, in the former, the person tries to live in harmony with the situation as far as it is practicable, but would not hesitate to bring about changes in the situation if it so needed ; the individual here does not helplessly succumb to the 'fate', so to say.

† In his remarkable contribution, Bose has made it amply clear that love in the mankind is a by-way process. Man desires not only to bestow his love upon someone but, also, to be loved. This reciprocity in love is its characteristic, and it is stronger in the child than in the adult. (A New Theory of Mental Life—Bose, G., *Indian Journal of Psychology*, 1933).

These are the two fundamental needs in the child that he seeks after the love for his own self. These are the basic means through which operates the pleasure principle. It may not be a hasty conclusion to view all other needs in later life arising out of these primary ones. Love for wealth, striving for power, and all are ramifications of these basic needs. But these needs, it should be clearly understood, are not always experienced consciously, and this fact presents us with difficulties in analysing the ways how adjustment takes place. A desire, as illustrated in the three cases mentioned above, may arise in the conscious region of the mind or in the unconscious region. If in the latter, it may be called back in the conscious sphere making it possible for the individual to see the feasibility of his actions ; on the other hand it may be so deeply imbedded in the subconscious region that the overt actions may not reveal any indication of the powerful motivating force behind it, it may be compared to a machine driven by a generator working somewhat far below the earth's surface in a subterranean tunnel.

This problem of adjustment may be viewed from two different angles. Firstly, the teacher should be aware of the usual ways how the individual adjusted himself. The varying mechanisms of adjustment in themselves would make an absorbing study. Next should be considered the end products of such adjustments, viz., its social effects.

MECHANISMS OF ADJUSTMENT

Rationalization

When a person purposively offers explanations incongruous to his actions and is not prepared to see through the facts, at the worst it may be called a case of lying. If however he tries to justify his actions his may be regarded a case of rationalization. Unable to evaluate his efficiency when an examinee lays the blame for his failure on the large number of holidays and ignores the simple fact that so many others in his position had passed he tries to derive some consolation from rationalization. It should require little persuasion to make him realize the absurdity in his arguments, and yet, in such cases many stick to their ground and thereby prove that they were not reasoning but rationalizing. Rationalization is something like reasoning superimposed. It is a process of false reasoning, rather, reasoning made unawares. The sour grape attitude is as much a case of rationalization as is the inclination to see the 'hands of the great being' behind a misfortune for which the person better had blamed himself.

Evidently, rationalization is a mechanism which can obstruct against one's seeing through reason, and since education is intended to develop one's capacity to reason and to discern, rationalization is an antithesis to education. Rebuff and punishment would only enhance the resistance and the person would take pleasure in rationalization for consoling himself. One takes to rationalization when he does not, or better, cannot realize the real reason. Had the examinee given less importance to examinatons, or if he had received sympathy for his misfortune, he would not have felt, more precisely his unconscious mind would not have felt the necessity for rationalization. In dealing with such a case, therefore it would be profitable to analyze the situation and find out the real reason for which the individual rationalized. Another point of importance is to check up beforehand whether the particular case represented intentional lying and offering alibi, or a case of genuine rationalization. Treatment of the two cases would naturally vary.

Substitution

Failing to attain the goal a person may have recourse to the path of substitution, *i.e.*, replacing the main goal with another easier to achieve. The substituted goal may have very little resemblance with the original one, nevertheless, its successful attainment would serve the purpose of reducing the tension. For example, unable to buy a new suit of clothes the person may derive temporary satisfaction in buying a new pair of boots and admire them equally. The unfortunate lad having noticed the child of a neighbour playing with a costly toy may go back home and realizing the impossibility of securing such a toy may play with an empty cigarette tin. This devised toy of his at least serves the purpose of partially releasing his mental tension.

The process of substitution may take other forms as well, *compensation* is one such way. Failing in the examination the boy may try to cover his feeling of inferiority and work hard to become the best athlete in the school. Boasting and bragging are compensatory mechanisms employed to cover up one's inability to attain the coveted position in the life situation. The habitual braggart hardly realizes the actual reason behind his bragging and would resent if the reasons were pointed out to him ; it would simply intensify his bragging.

Sublimation

It may be regarded as a substitution mechanism of a specific nature. Diverting the accumulated energy from the socially undesirable channel is called sublimation. More appropriately, sublimation is 'the unconscious process of diverting the energy of the sexual impulse to new objects or aims of a nonsexual and socially desirable goal.' The widow forbidden to remarry owing to her social conditions very often tends to divert her affection to the children of others or to the household deity or any other form of social work bestowing her love thereupon.

But substitution may not always take place under peaceful means. Hot arguments may lead to blows and the first shot is fired usually by the losing party. What he had lost by employing his brain he now tries to regain by employing his brawn. *Aggressiveness* thus is a kind of substitution and by virtue of its being anti-social in character is directly opposite to the process of sublimation.

Withdrawal

The thwarted needs may lead to withdrawal and escape from the conflicting situation which the person may feel unable to cope with. Such is the mechanism employed by the candidate who following his repeated failure in the examinations goes for hiding or takes to mendicant's life.

Regression

It is one of the very common types of withdrawal manifested in certain mental ailments as in *hysteria,* or what is known as *split personality*. As an instance of the first category may be mentioned the case of the patient who hating to visit the physician in connection with his illness, suddenly developed symptoms of paralysis. His unconscious mind now found a safety valve in the paralytic situation in order to escape from the impending visit to the doctor. In the case of split personality or dissociated personality the otherwise healthy adult may start behaving like a child and demand love and attention in an infantile mood. Later on he may revert to the normal phase and forget all about his previous abnormal state. The classical story of Jekyll and Hyde is a case of split personality. *Day dreaming* is a common form of withdrawal employed by almost all normal human beings once in a while. Thereby the person temporarily enjoys the fulfilment of his desires in imagination, and thus reduces the tension within him.

Identification

While reading a novel the reader may become susceptible to identify himself with one character or other in the story. Among the various characters in a crime novel he may identify himself with the criminal provided it was the character of the hero and baffled the crime investigators ; or else, he would prefer changing sides with the police officer who outwitted the criminal. In politics we often come across men, who having no definite ideology to adhere to , shift their position. A typical camp follower may change his party label following the election results, and identify himself with the winning side, and thus he secures ample justification for pride and self-esteem. It is the mechanism of identification which usually leads a child to take to the manners of his father. Likewise, a pupil devoted to a particular teacher would tend to copy the mannerisms in his teacher and imbibe the latter's likes and dislikes.

Repression

Unable to withstand the strain of the mental tension a person may be driven to repress the desire altogether. Here the tension and the attempt to prevent the desire from becoming conscious both remain unconscious. It may be questioned how then it is possible to explain this phenomenon. Workings of the mechanism of repression have been postulated with the aid of the technical methodology followed in psychoanalytical practice. Many of the secrets of the unconscious mind have thus been revealed. Intense hatred against father, for instance may cause the son to wish his father's death. But the very thought is something sacrilegeous. So, the *ego* represses the wish. Yet intensity of the desire may leave the *id* free to push the idea to the conscious level in the shape of a dream when the person is asleep; therein the wish sees through its fulfilment.

Repression in its turn may cause the operation of another mental mechanism, *e.g.*, projection or reversal formation. The commonest example of *projection* is the tendency to see those very faults in others which the person himself possessed. It is the thief who harbours the greatest suspicion against other's motives. By projecting his own guilt on others the guilty mind as if derived some consolation and satisfaction: "Ah, I am not the only one," his unconscious mind would say could it speak.

Reversal formation or *reaction formation* as the name implies is holding an attitude or belief of diametrically opposite in nature to the reality. The Indian addage that it is the sinner who wears the largest emblem of *tilak* contains a good deal of truth. The extreme zeal in proving one's honesty or truthfulness often proves the inner dark nature in the man. When carried to the excess in observing religious propriety it may give an indication of the person's guilty conscience which he strove to atone; the conscience received its dictates mostly from the subconscious mind.

The devious mental mechanisms give an inkling of the complex nature of the mind. Conscious reasoning of which the man boasts has very limited scope, indeed most of his actions are driven to emerge from the subconscious region. More often than not the conscious reasons offer to justify our faith and belief are superficial garbs with which we adorn the real desires emanating from the less known regions of the mind. Knowledge of the mental mechanism gives us a timely warning against hastily judging one's behaviour. Our overt actions often represent the resultant forces of the battles between the conscious and the subconscious motivations. When needed, the deficiencies that we may feel consciously are filled by the unconscious in one way or another. The wounds and injuries in the realm of one is attended and sympathized by the other, guilt of one is concealed by the other, or if necessary punished; and thus the much needed balance is maintained. The normal mind is a balanced mind and the responsibility of maintaining this balance is held by both the mental regions. A teacher himself warped with the feeling of inferiority will see derisive laughter aimed against him whenever a smile beams on an innocent face in the class. The absent-minded teacher is liable to take an unnecessary stern attitude against the same failing when noticed in his pupils. The man who had to swallow many a harsh word from his employer at office may unwittingly be harsh at home at the slightest provocation. Unable to see the difference between wishful thinking and purposive lying when the pupil is wrongly punished he ends in being trained to lie deliberately. In thousands of ways in adjustment the mind endeavours to maintain the path of the golden mean between the desires of its own and the forces in the environment. If on the other hand all attempts fail to dissolve the conflict there may arise in the individual a rupture in the normal state.

But the conflicts are not always tokens of danger. A grave conflict challenging every solution may lead to the dissolution of normalcy, in a lesser degree however conflicts provide with the needed impetus to work and strive. A mind resting in the bliss of peace for long would turn into inert state. We act because of one necessity or other. In the class where no pupil feels any urge to learn, where competition does not exist, and no one experience conflict of any kind whatsoever, the teacher would hardly have any work either!

RESULTS OF ADJUSTMENT

Adjustment should not be regarded as the concern of the individual alone. It spreads its effects on the society and the consequences may be far reaching in the end. In his efforts to survive against the rigours of nature the primitive man found the shelters inside the caves not only comfortable but a suitable mode of adjustment to make his existence possible. Building of dwelling places at a later stage and the developments in the constructional skill and architecture are further proofs how slight changes occurring during man's physical adjustment could have a great impact on the society. Probing into the devious ways of mental adjustment we would likewise come across many a powerful social institution growing out of this psychological process.

Sin has no counterpart in the physical world, it exists in the mind alone in the form of belief. Yet, conception of sin has given birth to the most powerful institution *viz.*, religion, in the course of the evolution of human civilization. Charity is the outcome of this conception and admittedly it has made the most magnificent contribution towards the growth of the modern civilization.

Adjustments it may be remembered are not one way processes. If religion and charity were regarded as the resultant effects of adjustment it is also expected that the individual members of the society would abide by these end products. Adjustment is a two-way process. While adjusting ourselves to a situation we also cause slight changes in the situation just as we alter our dwelling house here and there to suit our requirements. These insignificant changes might not be noticeable in the beginning but their cumulative effects would be far reaching indeed. The following illustration from the Indian history may show how progress in the political domain had evolved out of the individual cases of adjustment.

Advent of the British conquerors also had brought British culture and education to our shores. We learn from the history of education that the introduction of the English language in our educational system and the efforts for remodelling our traditional educational system were not due so much to usher progress in our country as to benefit the rulers. By active participation in this process India had gained in its homogeneity. The erstwhile subcontinent of several states now became the country of India, people of varied patterns of culture were united as they had never been before. To facilitate the ruling machinery Indians were encouraged to go abroad for education and receive training in the British pattern of living. Responses increased, but those who went to Britain did not return exactly with the same frame of mind with which they had gone ; while abroad they had tasted freedom and wanted to see the same freedom allowed in their country. Since India had already become a unified country attainment of this end was somewhat facilitated. This was the genesis of political movement which grew later. To direct the rising political consciousness among the people, the rulers encouraged the formation of the Indian National Congress though under their guidance and patronage but in time this organization turned to be the main platform for propagating complete freedom and for severance from the alien rule. It would be incorrect to surmise that all who went abroad had imbibed the same feeling. Some individuals instead of adjusting had only adapted themselves without contributing towards the changes in their environs. Others again, wanted the environs to change abruptly, while some others had swerved away completely out of sheer frustration. But the cumulative and total effect of the correct individual adjustments were ultimately responsible for ushering freedom in this country.

CHAPTER XIV

THINKING & REASONING

WHAT IS THINKING?

The value of education, particularly of formal education. does not lie in the accumulation of facts alone, assimilation of the factual knowledge gained is of greater consequence. To attain this end thinking and reasoning serve as vital tools. Proper use of one's discerning capacity and to rely on the faculty of judgment—judgment based on one's own experiences constitute the final goal of education. Yet, it would be wrong to surmize that education by itself is responsible for this great change brought about in the educand ; as we know, one's ability to think and to reason is limited to the extent of his native intelligence. All that education can do is to facilitate these mental capacities in the person. A person not educated may pass through similar experiences in life as one who was educated but may fail to systematize his experiences owing to lack of proper training. It is this drawback which handicaps him when compared to the educated. History, nevertheless, shows that lack of formal education is not *always* a bar to one's reaching great heights in success but such persons were rare ; as our mode of living becomes more and more dependent on the exploits of science and technology values of formal education would simultaneously grow.

It is rather curious that such a subject like thinking should have attracted little attention in experimental psychology. Compared to other mental phenomena not many investigations have been conducted in this field. We have, therefore, to fall back mostly on the logical analyses of thinking than on the experimental data.

Thinking to ensue has three main requirements. (*a*) background information, (*b*) a definite problem in view, and (*c*) the possible ways out of which a choice is to be made for the successful outcome of thinking.

Fantasies bear some semblance of thinking but are not thinking in themselves. Weaving his fantasies the person does not altogether disregard the realities ; fantasies need not necessarily be fantastic though it is usually so in the case of children. In reveries, however, the man remains passive, he is not impelled by any urge to connect the products of his 'thinking' with the issue with which he had originally started. He does not participate so actively in his fantasies as he does in his thought processes. The channel through which flows the day-dreaming is selected and its course decided upon mainly due to subconscious urge in the individual and very little, if all, by conscious logical thinking. In the latter he hits the solution after weighing carefully all the possible solutions of the problem and selecting one out of the many. So, in thinking one starts with the definite intention of seeking for *a* solution to *the* problem. Fantasies are means and ends put together, thinking is the means for *an* end. For this purpose it is necessary that the person should be previously acquainted with varied experiences, only then could he make the requisite choice. Education is expected to provide the individual with the varied miniature life situations from which he was to make his choice.

A young child's inability to think, or more appropriately, the inaptitude in his thought processes, arises mainly due to the reason that he lacks the background information. One does not think *in vacuo,* he thinks to see the possibilities, the potentialities, the correctness of his judgment, his thinking is the means to attain a certain end. Unless he has already acquired a minimum of factual knowledge and, also, a body of systematic knowledge in a particular field, thinking for him would hardly bear any fruit. A person without the basic knowledge in the physical sciences might think his most and yet find no solution to the problem as to how the voice emerged out of a gramophone. An arithmetic problem could be solved only when the foundation of the knowledge in the numericals was laid in the educand. If on the other hand a situation inevitably led to only one solution thinking would not be necessary. One did not think before eating when he was hungry, but he would when it came to deciding whether it was good for him to eat what was delicious to the palate but difficult to digest.

From what we have gathered in the above it is obvious that there is no universal method of thinking applicable to all problems; thinking is a process and is bound to vary from problem to problem. So, there could be no method to 'teach in thinking,' nor thinking could be learned.

CLASSIFICATION

In classifying thought processes we have to take into account the medium in which thinking took place. Thinking, for instance, could be called *perceptual* if solution of the problem required the use of the sensory-motor apparatus. In finding the way out in the maze experiment thinking flowed in the perceptual field, one had to decide perceptually whether the path taken would lead to the solution of the problem. Thinking, on the other hand, could be *conceptual* or *imaginary* if one had to depend on the imagery. Thinking of this type is employed for example in the planning of the class room arrangements. One has to rely here on his imagery to visualize how the room would look like if a window were fixed in the wall, or if the seats were rearranged in a different order. The end product in thinking is realized here prior to the perception had actually taken place. The artist mixes his colour in the mind before reaching for the pallette and so does the constructive engineer before he has drawn the blueprint. Thinking, again, could be on purely *abstract* basis. In order to answer the question,

Ugly : Beauty :: Strength : ?

one has to rely on his abstract judgment. Appreciating the relation between ugly and beauty and the application of this correlate in relation to strength could not be decided upon imagery or perception. Solution of the problems like $\sqrt{-1}$ demanded this kind of thinking as also in matters related to aesthetic appreciation.

Other Requisites in Thinking

Thinking is a subjective phenomenon caused in an objective situation—*I* think about *something*. Conditions in the environs are, therefore, closely related to the setting up in motion of the thought processes in the individual. For the best outcome in thinking optimum conditions in the environs are as much necessary as are the factors of subjective qualities in the thinker. By subjective qualities is meant here the combination of the innate and acquired abilities and capabilities in the person. The right combination of the individual qualities and environmental conditions would decide the quality of thinking. The primary requirements in thinking as laid down above are, a problem to stimulate thinking, and accumulated experiences out of which the solution was to be sought. These are the basic requirements in the mechanism of thinking. The success of the operation of this mechanism would however depend on certain other factors. We will now examine those secondary factors which individually or in combination promote thinking.

(*i*) *Intelligence :* Among the various innate traits intelligence holds the most important place in thinking. The level of thinking is ultimately decided by the quantity of intelligence that the individual possessed. The vital distinction between a dullard and a bright pupil lies not in thinking, but thinking intelligently. There is no mental function which could be singled out to symbolize intelligence, intelligence in man is expressed in all the mental operations. That is why psychologists employ tests in all the spheres of mind and judge one's intelligence against the sum total of the best results. Binet's device has gained in repute because of the introduction of tests of higher mental functions in which were included reasoning and thinking. Burt maintained that the results of tests in reasoning and thinking and judgment were sufficient to give an indication of the person's intelligence. But intelligence is not synonymous with reasoning or any of its kindred mental functions. Intelligence represents the inborn potentialities in the man, the ability to reason would much depend upon the training that one received. Good education ensures the person in his economically selecting the most appropriate answer out of the possible ones ; he would learn better how to make the best use of his past experience in solving the present problem, how far would he succeed would depend upon his native intelligence.

(*ii*) *Perception :* Knowledge of the external world starts with perception, thinking augments this process. During the early childhood perception aids in the comprehension of the qualities of the object and the child encounters not much difficulty in this exploratory stage. But very soon he is confronted with situations when the qualities of the objects clash in their interrelationship. Squareness of the peg and roundness of the hole are the qualities which the child could learn through manipulation but the impossibility of thrusting the peg inside the hole now arouses his thinking. With the growth of his knowledge in the perceptual field there is constant recurrence of such occasions which stimulate his thinking. This explains the value of perception in the mental growth of the child. This importance is further enhanced when we remember that the common man is guided in his every day life more by perceptual thinking than any other.

(*iii*) *Imagery :* With the growth of the child there develops in him the power to form images. As perception had helped him in perceptual thinking imagery now comes to his aid in conceptual thinking. While playing with the alphabets carved out of plywood, and looking at the printed letters he perceives these. But these perceptual experiences also leave their memory traces in his mind which cohere and the outcome is the concept formation in him. For some time longer the word alphabet would bring to his mind the picture of an isolated letter or a word, and when he was asked to write A he would consistently take help of his image. Similarly would he act in mentally adding 2 and 3 ; he may imagine the figures hanging before his eyes or feel their respective positions on his fingers. This is permissible at the initial stage of his learning, but at the earliest opportunity the child should be weaned out of this practice. At one stage in his life he may have judged an act good because of the accompanying image of his smiling father coming into the picture. But this could not be considered as the correct way for the growth of his discernment. He should be encouraged to judge goodness and badness in their abstract sense. It would be a big step in his progress when he could think independently of the concrete object or its imagery.

(*iv*) *Abstraction :* The ability for abstract thinking develops in proportion to the child's becoming independent of the perception and imagery in his thought processes. And, for thinking of higher order the ability to think in abstract terms is an essentiality. The necessity for this quality may not be felt in doing, for instance, simple sums in arithmetic, but the pupil would feel helpless in working out sums in algebra if his sense of abstraction had failed to develop. This ability would also be needed in the generalizations as postulated in elementary science. Appreciation of the moral and social, ethical or religious values too are dependent on the ability for abstract thinking. Left to himself any person of average merit would ultimately develop in him this mode of thinking, but proper education would help him in these directions more swiftly and systematically. This is one great advantage that the educated enjoy over those who were not.

(*v*) *Language :* Language has been regarded as the vehicle for thought, it conveys one's ideas to others. Language also helps in clarifying the thoughts. The confused jumble of thinking gradually takes a clearer shape as we try to write or speak. The words spoken, or written, help us to get a better view of the points we desire to see in them. That is why language has also been called the tool of thought.

Speech, however, is not always overt or *vocal;* while exercising its influence it may remain latent or, better, *subvocal* in form. While trying to recall mentally the multiplication table if one placed his fingers over the region of the larynx and the adam's apple he could detect for himself the movements of the muscles there. The same muscular movements become only more pronounced when the speech is vocal and audible, perhaps a few more muscles may be thrown into action then. In the adult mind these two are so intricately mixed—thinking and the correlative organic changes—that thinking at times has been believed to be nothing more than subvocal speech. This view has been advanced particularly by the behaviourist psychologists. But experiments have shown that thought is possible even when all the organs connected with speech, *e.g.*, the laryngeal muscles, the voice box, tongue, etc., were kept inert and inactive under the influence of, say, some paralysing drugs. So, speech and language though contribute considerably towards thinking they could not be considered as inevitable accompaniments.

However, the importance of language in thinking may be summarized as personal and also social. Language being the symbol of an object, a situation or an event, enables us to use our thought processes economically and systematically. It takes a long time for the child to appreciate the meaning of good, this idea grows in him with a host of experiences entailing concrete situations. As the expression sets in the mind it becomes a useful tool in describing a situation or an event economically which otherwise would have taken a long time to explain and the word produces a short circuit in his thinking. With plenty of such tools ready at hand he can now think quickly and think more. This is a great advantage that he possesses over the animals as also the primordial man. The social value of language in thinking is of no less importance. Progress of the mankind did not rest on a few great thinkers. Each man has contributed his share in the common pool of progress, maybe some conspicuously than others, but communication of thought among individual members has played a great part in building our ways of thinking.

(*vi*) *Attention:* Attention brings to the focus of consciousness the objects or ideas related to the problem in view. Clarity in thinking, and the ensuing solution of the problem, would largely depend on the efforts to hold the parts of the problem before the mind. What may appear in our effortless thinking as an incoherent mass of ideas becomes clearly linked and coherent when we attend to the subject matter. Attention is in direct proportion to the will to attend and the interest in the subject. Psychologists are of opinion that the will in the individual is related to his intelligence. A more dominant and persevering will is an indication of superior intellectual calibre whereas a dullard drags his will cumbersomely. Nevertheless it is a fact that success in the continuity of attention could be partially achieved by proper training though it could be facilitated automatically by the inherent attractions in the subject matter; we take less interest in thinking about an issue which did not interest us.

(*vii*) *Freedom:* Very frequently we use the expression 'I think' when factually we just do not think, we adhere to the thinking of others and gain a sort of self-satisfaction by declaring 'I think.' Man though prides himself as being a thinking being—looking critically it is mostly a false pride, he is more happy to think as others do. The herd instinct prevails itself upon man's very common thinking. Millions had previously 'thought' that the earth was flat; a man however had to pay with his life for thinking correctly. Most of the conventional thoughts represent pooled progress of our past but some of these are obstacles too. Many of the accepted thoughts are beliefs in the actual sense of the word and not real thinking. Beliefs are guided more by affective aspect of the mind than by cognition, the latter receiving due emphasis in real thinking.

It is rather difficult to draw any strict line of demarcation between thought and belief. Thinking is caused by proper selection of the material out of those which were accumulated through our experiences, and this stock of experiences is not unaffected by our faiths, beliefs and feelings. To isolate one's reasoning from feeling, to sever cognition completely from affection is a difficult task and we do not consider it worth our while in everyday life. Consequently, the freedom of an individual's thinking is circumscribed by the traditions, laws and social customs prevailing in the land. In other words, the social barriers impede the child's thinking independently. At the same time it has to be admitted that these have got their values. The individual by imbibing the social heritage accentuates his own progress. If each child had to start from a scratch and think everything for himself progress would have been much retarded. A balance here has to be maintained. While expecting the child to follow the thoughts of the group, he should be encouraged as far as practicable to take his own lessons and think for himself. This is the way of adjustment in thinking. It is the freedom in thinking which created Benjamin Franklin and Issac Newton. Treading the trodden path would have only resulted in producing two decent citizens, but then they would have gone to their graves unknown.

Thinking & The Subconscious Mind

While discussing the role of the subconscious mind in the cognitive life of the man it was observed how unobtrusively the former could influence the conscious region of the mind. Many a problem has been solved during the sleeping hours. This does not mean that one may go to bed with the problems in his mind written on a piece of paper and kept under the pillow to find the solutions ready the next morning. Effort in thinking is essential, but consolidation of the action in a subtle way is something not to be ignored. Learning results not only from the efforts made but, also, by proper assimilation of what has been previously learnt. Here lies the value of the rest pauses in learning. The process of thinking is a continuous chain of actions rising from the lower to the higher order. With the aid of reasoning, for example, we build the edifice of thinking. In this process the desirable progress could be maintained only if the previous steps were properly assimilated. In our eagerness to solve a problem we often tax the mind and do not allow sufficient time for consolidation of the previous steps. Given rest, as it happens in sleep, this assimilation takes place subconsciously and aids in the conclusion of the thought process.

REASONING

Reasoning is the adjustment process in thinking, adjustments needed in solving a problematical situation. It acts like brakes without which most of our thinking process would degenerate into reveries and fantasies. Thinking is the act of selecting the proper response from a host of possible ones, reasoning tells us why it is to be selected. Reasoning, in a way, acts like the hammer striking the wheels of a train to find out which of these deserved our attention. In thinking the problem in view is analyzed into its component parts, by applying reason we endeavour to reassemble the parts into new wholes and select the one which answered to the problem.

There are, however, occasions when a step or two in the reasoning process are skipped off and one visualizes the end rather abruptly. This is what has been described as insight.

The level of reasoning as in thinking is determined by the familiarity with the varieties of experience. But the extent to which the informative material may be used is determined by the native intelligence of the person. Reasoning compared to thinking is like the sharpness to the knife, it depends on the use made of them, with the difference that constant use may reduce the sharpness of the implement while in reasoning the keenness in the thought process is enhanced.

CLASSIFICATION

Reasoning may be logically divided into two categories: *deductive* and *inductive*. In the former one deduces the results on the bases of his own observations and experiences. In the latter, a generalized statement is applied to the specific cases. Left to himself the child would naturally be inclined to make use of the deductive method of reasoning more frequently than the inductive form. When the maladjusted child makes mental notes of the facts that he was badly treated by his elder brother, sister, cousin older than himself, father at home and the teacher at the school he would tend to generalize that all those who were older than himself treated him shabbily. His conclusions may be erroneous but he would be adopting the process of deductive form of reasoning. On the other hand, his applying the knowledge of condensation to the phenomenon of rain would be a case of inductive reasoning. In the inductive reasoning too the outcome may prove to be wrong if the individual started with a false hypothesis. The resulting sound in the dark room may be attributed to the presence there of evil spirit, before that, however, existence of the evil spirit would have to be assumed.

REASONING AND EDUCATION

Mind is not capable of retaining all the particulars of our isolated experiences. Yet, our very existence would be jeopardised if we failed to benefit from our past experiences. Each must be guided to his destiny by the lessons he derived every day from his own life experiences as also of others. In this respect his own observations followed by generalizations, the outcome of deductive reasoning, would benefit him more. These generalizations, along with the experiences borrowed from others, he should be ready to apply as the situation demanded in the future, and this is the way of inductive reasoning.

Generalizations are experiences made compact, and these can be conveniently stored in the cupboard of the mind and brought out for use as required. Mind is capable of retaining these brief files of accounts. It may be questioned as to which of the two methods in reasoning is more suitable for the young educand. Both have their own values. Judging, however, from the abundance of why's and how's in the child we get an indication of his inward inclination to build up his own conclusions. The deductive way of reasoning and thinking appears to appeal him the more. After drawing the conclusions of his own when he tries to apply them to newer facts at times he comes across contradictions for which he was not prepared. Repetitions of the occasions when the clouds brought rain would lead him to conclude that rains followed the appearance of the clouds. When, however, he witnesses the occasions when clouds failed to bring rains the young observer would have to make amendments in his earlier notions and reorientate his views. So, knowledge grows out of the application of deductive as well as inductive forms of reasoning. But the scope of the requisite background information being limited in the child he often experiences difficulties in drawing conclusions and inductive reasoning has necessarily to be applied. No parent would like the idea of giving indigestible food to the child for the latter to learn that that type of food was bad for health! The child should better accept the premises that undercooked food is difficult to digest and so detrimental to health, and then test the validity of the statement on any unfortunate occasion that may arise later. Likewise, in imparting training in discipline, we have often to have recourse to the inductive form of reasoning. If the child were left to learn by himself the values of discipline, well, all progress would be switched off. The fruits of civilization gathered by the mankind over thousands of years could not be acquired by any child in his own life time if he were left to learn all by himself.

CHAPTER XV

TEMPERAMENT, CHARACTER AND PERSONALITY

Our present study would differ from the past enquiries in that the mental functions here would not be studied in their isolation but in their totality. Psychology undertakes to study the phenomenon of, say, emotion, whence it rises and the specific features manifested in the state of anger, but there is also another aspect of anger. The man who tends to exibit this emotion at the flimsiest provocation is intrinsically different from the man who is stolid 'by nature' and who usually remained unmoved. This difference in the emotional state would affect each in his own way but would affect all the mental aspects in the same person. A person, for example, with the 'analytical bent of mind' would like to analyze every situation which he may be confronted with before he acted, whereas, another may act first and think afterwards. One man may like to live in isolation from the society and would relish this self contentment, another may be in a perpetual effervescent mood seeking company to 'open his heart' even if the latter were only recently introduced to him. Were it necessary to study the reasons for such variations, our past method of considering each aspect of the mind separately would not be of much help. It is true that in such an investigation emphasis may have to be laid on the emotional aspect or the intellectual, the physical or the mental, but this would not be done while neglecting the rest. We would now see in how many different ways such a study could be possible.

CONSTITUTION

When we say that the man is *constitutionally* weak we refer to his physical make-up. On a particular occasion this man may put up conspicuous activity and by exerting himself he may possibly astonish those who knew him, but then he would fail to keep up to his newly won reputation for long, his output would dwindle down to the usual level before long. One may describe him physically inapt 'by nature'. Now, this state may result from a specific organic disability, or his disability may be due to the sum total of all the organic conditions constituting the peculiarity in him. The general condition of lassitude in him may create an impression that he was mentally dull, but to seek for the real reason one would have to look into his physical make-up or constitution. The word constitution according to the Concise Oxford Dictionary means 'character of the body as regards health, strength, etc.'

TEMPERAMENT

It is highly improbable that a seemingly languid person would for long hold a job which demanded unflagging alertness of the mind. Likewise, another who seldom permitted his emotions to have a hold over him, who was accustomed to 'look at all the sides of a picture' when most others might lose their head would seldom take to politics as his career which required quicker emotional reactions. Again, the person who was tempted to act and then think would hardly be considered suitable for the executive posts entailing sobriety of judgment for carrying on their responsibilities. An athlete has never taken to fine arts, and artists are usually notorious for their passing moods. Instances could be added to any length to show how individuals were guided by their temperament. In these illustrations though we have considered man's behaviour patterns in their totality, the shift on the emotive aspect is obvious. Again, these distinctive features in the individuals result more from innate reasons than those which could be labelled as acquired. Temperament may, then, be described as the general affective nature of an individual determined more by his inheritance than by acquiring in his life. This definition leaves us free to take into account the acquired factors contributing their share in building up a man's temperament. If a person took to drinking regularly, his continued state of inebriety would react upon his normal behaviour patterns. So much so, that a habitual imbiber could be easily spotted out in a group from his facial characteristics, gait, and the general manners in his response. For one thing, he would be more excitable and susceptible to provocations resulting in the greater spontaneity of his actions. Evidently his mode of actions may be ascribed to the continued emotional state. Contrasting would be the picture of a person habituated to the opiates ; slow and lethargic would be his normal pattern of response and he would be less easily provoked by emotional situations. In other words, if a person were allowed to retain a particular frame of mind for a considerable period, it would tend to become a specific feature of his mental make-up. The specific emotional state would constitute the mark of his distinction from others, this factor in the individual difference would form the basis of his characteristic individual feature. These illustrations go to show how a seemingly temporary effect may gradually come to be retained in the organism and alter the general make-up of the individual. It would not be wrong to attribute this change to the metabolic effects constantly undergoing in his system.

But similar peculiarities in the individual could also be noticed due to the inborn organic conditions over which one had no hand. In the earlier chapters we have seen the pronounced influence that the endocrine bodies could produce on the man's mind. Apparently insignificant difference in the thyroid or the adrenal, for instance, could induce remarkable states of permanent nature. Greater secretion of the sexual endocrines would colour the mental outlook of the individual in which there would be a preponderance of sexual thoughts and abnormal cravings. Deficiency in thyroxin, the chemical substance in the thyroid gland, would produce not only dullness in the emotive states but; also, in the intellectual sphere, and the individual would come to be a slow witted person of quiet temperament. The emotive propensities in temperament can be traced to the combined efforts of the endocrine hormones though the nervous system has some contributions to make. A child born with his brain underdeveloped would not be much different from the person suffering from hypothyroidism.*

But a specific temperament of the individual could also be psychologically induced. The child constantly teased at home would in all probability develop sensitivity in his nature, and in future would be highly susceptible to provocations. The boy who was accustomed to get things done for him for the mere asking would be irritated and annoyed if he were called forth to exert himself to achieve an end. The first case may be explained as due to the constant presence of excess of pituitary or adrenal secretion in his blood, we know that excitement tends to enhance the secretion of these glands, and constant excitement would tend to leave these organs readily reactive. Likewise could be explained the peevishness in the person who was disposed against spending much of energy. We may thus see how the psychologically initiated conditions may find their echo in the changed organic conditions.

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* Curiously enough philosophers in the remote past were no less interested than we are in probing into the reasons for the individual differences in temperament. Hippocrates (420 B.C.) had classified man's temperament into four broad categories, viz., melancholic, choleric, sanguine and phlegmatic. The reasons he had ascribed to these mental states may be looked upon as somewhat queer. *Melancholic* temperament, he said, was due to the excess of black-bile (?) in the body which caused such people to be slow in thinking and acting. Another type of bile which he called choler (?) was according to him responsible for producing the quick witted, hot tempered, active type of man he labelled *choleric* (which in the less sophisticated American language may mean the 'he man'). According to this philosophy it is the excess of blood in the vessels which made a man cheerful and optimistic, and these persons were called *sanguine*. Similarly, excessive phlegm or the mucus in the cough made people lethargic, passive, or *phlegmatic*. Though most of these physiological distinctions have since been proved to be wrong many of the expressions have survived the 2,300 years of their usage. We still call ill feeling as 'bad blood', and sanguine and optimism are held as synonymous. The Hindu philosophers too had described the ailments—mental and physical—due to the basic components of *vāyu*, *pitta* and *kafa*, and these were considered the principal elements which went into building a man's temperament.

If the undesirable temperamental conditions could be artificially induced in the person he could be expected in bringing forth desirable changes. Cases of hypothyroidism for example may be considerably remedied by administering thyroid extract from the animals. The temperamentally dull thus could be reverted to the state of normalcy. The mentally irritated state caused by continuous dyspeptic conditions could be removed by curing the physical ailment in the person.

To conclude, we find that there is plenty of evidence in support of McDougall's definition of temperament. He has described temperament as "the sum of the effects upon one's mental life of the metabolism or chemical changes that are constantly going on in all the tissues of one's body". It would have been an ideal definition indeed if he could have found his way to add: "as indicated through his general emotional make-up". Thus the basis of classifying temperament could have been easily understood.

Temperament may be classified in many ways based on the criteria of, for example, interest and attitude, likes and dislikes, etc. But all the patterns of classification are concerned more with the emotive life of the man than any other. According to one of the classifications which also enjoys wide popularity, people can be classified into *extraverts* and *introverts*. Those persons are said to be extraverts whose interests are directed mainly outwards rather than inwards, the latter type being called introverts. Temperamentally, some feel unhappy in the absence of others' company while some would prefer solitude, some would be glad to keep themselves busy helping others, some feel little inclination in this respect; some would endeavour for self-display, others may pay scanty heed to their evaluations preferring to remain withdrawn in themselves. The former belong to the category of extraverts while the latter are examples of introversion.

CHARACTER

Character may be defined as those distinguishable features in the man which are the outcome of training of the innate tendencies on the model of the prevailing social and ethical standards. The potentialities in one's character are indicated by his overt behaviour in a specific situation calling forth for such characteristic features; the ensuing act itself is called *conduct*. A person may be familiar with all the social codes and verbally adhere to them, but his actual conduct alone would be the main criterion of his character.

Evidently, character formation depends on the training afforded to the individual; it is the cumulative effect of his environs which are expressed in the character. Formal education is, however, not an essentiality in the character formation. Very few of the old men and women inhabiting the remote parts of our country enjoyed the privileges of formal training but, in matters of character, they are in no way inferior—if not superior—to the people formally educated. Even today among many tribal people in India the crimes of robbery and violence are unknown. By taking lessons from their actual experience in living they have found certain principles as valuable for harmonious living and they abide by these principles. It is said that the word theft did not exist in the Manipuri language until of late.

Formation of character then is a kind of learning, direct or indirect, formal or traditional. But it is not synonymous with the word learning. Learning is a process, and so is the formation of character, the former may have any end in view, the latter has a fixed goal. In the broader sense of the term, learning denotes the process in the sphere of intellect or habit, character formation is learning with the ethical ends in view. Shivāji and Rāni of Jhānsi were not learned people by the present standards, but they were persons of sterling character. Learning is a process but training in character is learning put to a specific end, and this end is decided upon by the accepted social and moral standards.

Since character formation is a kind of learning it is to be expected that it would have similar limitations as are there in other sorts of learning. Environment is the stimulating factor which determines the mode of character but the organic conditions would decide upon the extent. A feeble-minded child could hardly be expected to attain those ideals which rank high in character formation. He does not possess the innate ability to distinguish good from bad and thereby suffers in his character formation.

The teacher occupying an important part of the child's environment evidently has much to do with the pupil's character formation though in a limited way. To ask the pupil to behave in a particular manner is one thing and to offer him the situation requisite for the desired end is another. And it is in this respect that the teacher's efforts are limited. The pupil hardly spends more than one-fourth of his day in the school environs, and even then not all the days in the week. The question of putting into practice which he was taught at school is solved not in the school so much as amidst the environs elsewhere. For instance, preaching sermons on honesty would be of little avail if the pupil gathered at home that honesty was something not to be taken seriously—if not openly ridiculed. After all, those with whom he has established greater contact, particularly in the emotional sphere, for instance the parents, friends, neighbours, etc., play much more influential part in moulding his conative, cognitive and affective aspects. And there are of course numerous unforeseen situations which create dilemma in matters of character formation. The following is one such problematical situation.

Those were the days when Bengal experienced serious famine conditions. Thousands of peasants from the neighbouring areas of Calcutta thronged in the town in search of a morsel or a mouthful of rice water. A child, aged about three years, had witnessed many of the unavoidable scenes of death from starvation on the open public thoroughfares. Those ghastly spectacles naturally had provoked thought in the child. He had learned from his queries that lack of food had caused deaths among these miserable persons. He was, therefore, reasonably agitated though not perceptibly as was evinced in his conversation with his father:

> "Would they die if they got rice to eat?"
> "No, they would then live like you, son."
> "Why then don't you give them food?"
> "Haven't much to give, you know."

Now, the child was preparing himself for his meal at noon along with his parents. Suddenly he queried, "Dad, why don't you give your food to that man, he would then live . . ." What should have been done to retain this sense of piety that was now growing in the child?

PERSONALITY

It may be simply described as the integrated organization of all cognitive, conative and affective, as also, the physical characteristics of an individual reflected in his behaviour through his interest, attitude, aptitude, capacities and abilities. *Constitution* lays greater emphasis on the inherited organic aspect of the individual. *Temperament* indicates the person's emotive propensities which somehow are related to his inherited physical aspects. *Character* pertains to the ethical and moral aspects of the individual shaped out in the course of his training. *Personality* takes into account all these and something more which we often fail to recognize. Here are a few expressions commonly used in designating personality.

"A's personality suffers owing to his lameness", "B's tall stature is an asset to his personality". In referring to the physical traits* here the speakers obviously considered these as parts of the total personality of the two persons. It may, however, be noted that the physical trait in A, which was due to an accident, is an acquired characteristic, whereas that in B the trait referred to is hereditary. Again, "Sobriety of C is in direct contrast to the flippant moods of D ; I prefer C's personality." The emphasis is now shifted to the mental aspect of the individuals concerned. C's sobriety may be due to his abundance of inherited intellectual trait which impelled him to reason and rely on his own judgment and to think before he gave his views ; or, this characteristic feature in him might bear the stamp of his social heredity, an outcome of the environment. On the other hand, D's lightheartedness may have its origin in his oganic constitution as much as the social atmosphere of gaiety in which he was reared. Anyway, the point of similarity in the last two illustrations is that both refer to the mental qualities though in one case the mental component is innate and in the other acquired.

It is now conceivable how the physical and mental components, constituting the innate and acquired features contribute towards the growth of one's personality. There is, however, another aspect of personality which has been left unconsidered uptill now, viz., the role of the unconscious mind and which now calls for our attention.

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* Trait: an inherited physical, organic or psychological component expressed in the man's behaviour.

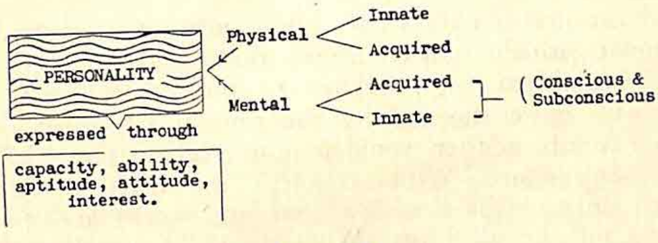

FIGURE 25.
DIAGRAMMATIC REPRESENTATION OF PERSONALITY

"E is quick to see other's views and can adjust himself, whereas it is difficult to argue with F, his views are divorced from truth and yet he is not pepared to see through this shortcoming." Yet, E and F may have been brought up in desirable environment and received high standards of education. Psychologically, the difference between E and F may lie in the fact that the former uses his conscious judgment in reaching a decision whereas the latter felt somewhat driven to take a decisive judgment without restraining himself to scrutinize it. The motivations in F are more in the nature of unconscious promptings than conscious discernment. While discussing the functions of the unconscious mind it was observed that very often man held other's thoughts believing to be his own, likewise, his own thought is sometimes twisted out of reality which fact he may not see.

Taking stock of the situation, personality may be regarded as the outcome of one's physical and mental traits—hereditary and acquired, of the conscious or the subconscious mind. Personality is the reflection of a person, his mental and physical states, as judged by others, his characteristics which went to distinguish him from others. These features are revealed through his social relation and human intercourse. Like all other mental phenomena it must find its expression through some media before its nature could be judged. The media are the person's likes and dislikes expressed in actual situations, actual abilities or potential capacities, his attitude and interests.

GROWTH OF PERSONALITY

It is not denied that the physiological factors are as much important in the development of personality as are the psychological issues. The latter, however, have special significance in education.

For the first few days the child's only requirement is the adjustment with the new environs. Birth is a critical phase in the individual's existence, perhaps the most critical phase. The body is no more warmed by the human incubator of the mother's womb, neither would it now receive its nourishment without any effort. With its birth the body machine is switched on and the first few days and weeks are spent in 'warming up' the machine. What the child actually felt like at this stage is a matter of pure conjecture. Looked through the adult's eyes, James's interpretation would appear to be the nearest to the truth, the world for the new born infant is a "big buzzing blooming confusion".

Before long, however, it begins to create a clear impression of its egocentricity. Beyond its own self the world for the infant does not exist. Meanwhile grow its perceptual powers. Among all the sense organs the optic mechanism receives priority in development. And as it gains in its ability, with its aid the child learns to 'recognize' the person meeting its incessant needs. The earliest process of this awareness is not recognition in its correct sense but conditioning. Day in and day out the infant observes with its still inapt vision 'a thing' approaching it to relieve its hunger and discomforts. Soon this 'thing', the mother, becomes a welcome sight. With the perfection of this stage, foundation is prepared for the new life where others too exist besides its own self. Maybe it is too early to realize this fact. The mother is looked upon as a part of its own, she is a source of pleasure like the fingers of the baby which are sucked with relish.

Next develops his speech, very rudimentary and primitive though, nevertheless something audible. At the earliest stage of babbling, speech has as much function as movement of the limbs. It does nothing to awaken the child's realization, but the vocal mechanism develops all the same. A fresh stage is set in as the child continues to listen and giggle and babble. The mother smiles as she utters the name of the child. A fresh set of conditioning thereby takes place. It likes the sound of its own name when pronounced—is it not connected with the mother's smile?

As sense dawns upon him he finds that he is the sole bearer of that name, none but he is entitled to respond to this name. The name erects the boundary wall around the child's existence. But the wall is not yet firm, in distress the child looks to its mother, she—it feels confident—would never allow any distressing situation to come near it. Alas, later the very mother becomes sometimes the source of distress. In one way or other she forbids the child from deriving the pleasure of drinking milk at any time he desired (routine must be rigorously followed), forbids him to play with fæcal matter, insists upon his sleeping at regular hours even when he loathed compulsion, and thus grows the number of social prohibitions. The child now realizes that he must forego many a pleasure-seeking device. Awareness of his own self of having a separate existence is thereby strengthened. This reaches the final stage when the child becomes conscious of his own name and starts using the first person singular. The pleasure of remaining infant now recedes in the background of the subconscious mind. This is a painful experience but he has to adjust himself with the inevitable. This is the most delicate stage in the growth of personality. Now on he will meet with situations recurrently demanding for his adjustment.

Not only many things are now forbidden but situations unexpected are forced upon him. The child must feed himself, and clothe himself, and must do so in conformity with the social codes. He may do so grudgingly and sulkingly, or he may derive pleasure out of these novel situations. It all depends on how he is trained. If he felt that his co-operation was sought after, life would be joyful; if on the other hand he were required to abide by the parental rulings only, he will feel like a serf rendering service to his master. What he shall feel and will and think years hence will be decided now. Life is a continuity. Complexities thrust upon him forcibly against his consent will only end in the formation of complexes in the later years. And, each individual has got his own organic make-up, and each is reared in his own environs, and each will grow a different personality. Who are the persons who contribute the most towards this development?

After the home environs, friends form the next best makers of personality (or wreckers, sometimes). But their influence is not so deep as that of the parents and the nearest relatives during the early childhood. Schools form the third important factor in the development of personality. The school is a radically different environment where the pupil is required to adjust himself amidst others of his kind but, also, it is there that the child finds a new source of inspiration and new ideas, and his attitude and aptitudes take a new turn. If the only child in the family was accustomed to receive showers of praise for nothing, at school he finds with rather dismay that praise is something which has had to be earned by merit. Praise usually stimulates action. If on the other hand, the desire for being praised exceeds the desire for earning it through work, the child will either sulk, or seek for short cuts for guarding his self-esteem. The latter may lead to daydreaming, belittling other's efforts, devising cheap methods of drawing attraction and so on.

If the foundations of personality are laid at home the structure is completed in the school. In school, again, the pupil is confronted with variegated samples of situations demanding his rapid adjustment giving a warning as it were that such will be his lot in the future. The teacher introduces new patterns of standard in the pupil's mind, new patterns in the ethical, social and moral values with which the pupil might not have been acquainted at home.

The question now arises: how to find out if personality in the individual was changing in the right direction? In the following will now be discussed some of these techniques.

METHODS OF STUDYING PERSONALITY

What criteria are to be used in assessing personality? In view of the fact that personality is man's reflexion of his total being, to describe all the features in an individual it would be required to launch upon a programme of compiling a book! We are, however, not interested in each and every aspect of a person; only those qualities are of value which have some bearing upon social intercourse, moral or emotive qualities for instance. It is for this reason that such traits are given more prominence in the studies of personality. The physique of a person, his voice and gait, may be of some value when he is introduced into a society, but these have their usefulness up to an extent. Soon after he will be judged according to the other qualities that he possessed, his success in adjustment, his moral behaviour and the ability to see other's viewpoint, his sense of humour and the unbiased character of his judgment. Consequently, these would receive more attention in the evaluation of personality.

Personality may be studied from qualitative as well as quantitative standpoints. The former is of greater consequence when there arises a necessity for probing into the reasons for malformation in one's personality. Such a study would naturally be of analytical nature. Quantitative estimation, on the other hand, is helpful for the purpose of comparing an individual against the group. Some of these methods are described below.

1. *Case History*

The personality at any stage of life is the cumulative effect of the past of the individual. Personality evolves; it is not abruptly formed. An isolated incident in the life of an individual may cause profound effect upon him, but for this event of accidental nature to have stuck in his personality there must have accumulated sufficient reasons beforehand. When a clay toy is in the process of being moulded a pebble accidentally included in the soft earth will show its effects when the loam gradually hardens. The unsatiated love in the childhood would have its repurcussions in the later stages of life; whether he would grow into a publicity hunter or one constantly belittling other's achievements would be decided by other factors, social and individual, contributing towards his total personality. A careful scrutiny of the case study would reveal how the twisted flower of today grew of the uncared and unwatered bud that was yesterday. It is needless to add that it requires a good deal of knowledge in academic psychology, acquaintance with the social condition in which the particular case was reared, as also discerning eyes of the interpreter, before a successful study could be made.

2. *Rating Scale*

It is the simplest form of quantitative evaluation of the distinguishable traits which combined in the formation of the total personality. Those factors which have larger bearing in matters of social intercourse are evaluated on a rough and ready scale not difficult to prepare and which also appeal to our common sense. The traits usually selected for such purpose are: honesty, aggressiveness, activeness, responsibility, social adjustibility, intellectual calibre, educational accomplishment, interest etc. Now, each of these personality traits could be sized into say, five grades, viz., the maximum possible, the minimum possible, the average, and two points between the average on the one hand and the maximum and the minimum on the other. The individual in question, then, could be graded on this scale according to the best judgment of the person responsible for grading. It is assumed that the assessor, by virtue of his thorough acquaintance with the person whose personality he was to evaluate, would be able to do justice in matters of rating. He would, also, be expected to have previously gained wide experience of these traits as observed in the average human beings, and possess an unbiased mind for his evaluation to be considered reliable.

The personality rating of Mr. X. Y. Zed as depicted in the Fig. 26, indicates that he has his greatest virtue in matters related to honesty. In educational and intellectual fields he is near about the average. But his greatest drawbacks lay in his laziness, he is inactive. This table, however, fails to indicate, and it could not, whether this inactivity was due to reasons innate, or whether it grew out of the lack of freedom in his activities experienced during the childhood ; this fact could be determined only through his case history. Anyway, his inertness would be his greatest handicap in his life unless it was rectified. After all, the potential abilities in a person are of not much value unless the person could translate his capabilities into actual performance, and of this Mr. Zed did not appear to be much capable. Consequently, no bright future could be predicted for him. Again, it could not be stated from this table, or, *psychogram* as it is called, whether his low rating in the aggressiveness was due to the inherent lack in the emotional upsurges as is natural in any common man or if it was because of his personal inertia. For this information too

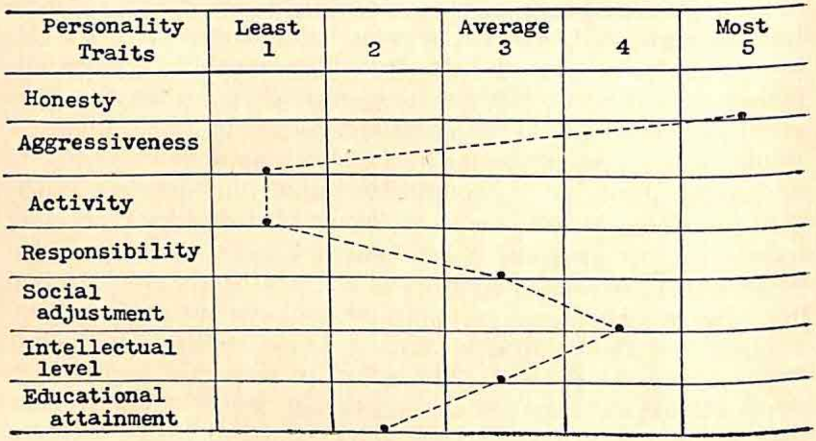

FIGURE 26
PSYCHOGRAM

we would have to wait for the facts to be revealed in the case history. The rating scale thus tells us what the man is like and nothing more, how he stood in comparison with the average person, and that's all.

This type of paper-pencil test has one great drawback: it is not objective in nature. If the rater in the above case happened to be rather aggressive in nature he would tend to exaggerating the aggressive character of the person he rated. The advantage, however, lies in the fact that personality of several persons could be studied together.

3. *Behaviour Test*

In the Behaviour Test, as the name implies, the Subject's personality to be evaluated, based on his behaviour against a specific situation, his actual response to a premeditated condition, is taken into consideration. In a simple problem as in solving a jig-saw puzzle, for instance, the Subject would not only expose his native intelligence—by solving it quickly or taking long time—but, also, the other aspects of his personality would be revealed. He may be tenacious enough not to be deterred by failure, or may prove frustrated following a few vain attempts and leave the work unfinished. Honesty in him may be indicated by his rigorously adhering to the instructions, or, by adopting an easier but dishonest means. If he laid the blame for his failure on the puzzle itself it may then be surmised that he lacked in self-criticism and was incapable of taking objective view since others could do the task successfully. Sufficiently large number of tests suitably devised for the specific purpose of judging the various criteria of personality constitute *battery of tests.*

Unfortunately a thoroughly reliable method of testing personality which at the same time could be handled by school teachers without much technical training is not yet available. Much remains to be done in this respect. Nevertheless, the value of such a testing programme is immense indeed. An individual's intellectual potentialities and educational capabilities could be put to use only in a social environment. Unless he adjusted himself in his field of work where he earned his living or among his friends and relatives, all his potentialities would remain handicapped. And, the earlier such weak spots in his personality were detected the better it would be for him, the chances of their being rectified would be larger. It is from this point of view that the personality problems form a valuable topic in educational psychology.

CHAPTER XVI

DEVELOPMENT TILL ADOLESCENCE

PROBLEM STATED

By accepting the fact that life is a continuity it is not presumed that development of the child from its birth to maturity maintains a uniform progress in all the mental fields. Were it so, it would also have to be assumed that the child is a diminutive man possessing all the qualities of an adult differing only in degree. This would lead to our reverting to the discarded hypothesis. There are numerous mental phenomena like belief and sentiment which make their appearance at later stages of development and are fortified as the child progresses towards maturity; many others like the eidetic imagery or the playways after having served their purpose are gradually eliminated. If the principles in education were to be based on the psychological development, if the changes in the former were to be correlated to the natural shifts in the latter, it would necessitate the teacher to be acquainted with those fundamental changes which appear in the child during the various stages of development leading to maturity.*

In this connexion the teacher's responsibilities are limited to the extent of introducing the situations in the course of the child's development which would broaden the scope of the child's experience. The child should be allowed to gain from its own experience, the teacher certainly should show the best means of doing so, but he should defer from applying any method which could be construed as forcing the development. From this point of view pedagogist's role is very similar to that of the healer. A skilled physician does not think of healing the diseased organ himself or of growing a new one. In repairing the damaged tissues he prefers to wait and let the tissues use their own capacity to heal, he would play his due role by creating such favourable conditions in which the tissues could hasten the process. The science of pedagogy is not different in this respect. The child

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*Maturity *involves* development. Development here merely implies the changes which take place in the growing organism. Development may be progressive or retrogressive, and it does not indicate any direction or foretell the end of the process, whereas, in using the word maturity we are aware of the possible future state of the development.

possesses the inherent inquisitiveness to know and to learn. If the teacher knew how inquisitiveness grew in the child, how it was manifested in its diverse ways, and how best it could be supplemented at the different stages of development for the most effective results to ensue, he would have performed his duties.

STAGES OF DEVELOPMENT

The principle of quantitative changes leading to qualitative differences is seen best in the domain of biological development. A seed, and then a plant in bloom, one grew from the other, and yet what a difference we witness. This striking change is the outcome of almost invisible modifications that took place inside the seed every day, nay, every hour and every moment. With apologies to the poet it could be said that the child may become the father of the man some day, but, to start with he resembles more of animal than man at the outset. If we have to make use of such expressions as infancy and childhood, adolescence and adult, it is only for the sake of our convenience in describing the qualitative changes which appear at the different stages in the life, the person remain the same anyway. One stage merges kaleidoscopically with the successive one. Legally man reaches maturity on completing his eighteenth year, but biology does not recognize such narrow boundaries.

Maturity of two adults of the same age could not be located on the calendar on the same day. In the tropical countries girls mature earlier than in the colder regions, in the northern Scandinavian countries maturity arrives later than in, say, southern France. These differences are born of natural causes. On the other hand, infancy in the child could be prolonged if the parents insisted upon its prolongation, and thus an adolescent may grow up physically into the adult stage and yet fail to show the expected signs of psychological maturity behaving like an adolescent because of the overprotective parents. The demarcations of age as stated below should therefore be considered as approximate values decided rather arbitrarily.

The general laws governing growth may be summarized in the following:—

(i) Growth is both quantitative and qualitative.

During its growth the child not only adds to its height and weight but ultimately changes radically from infancy to adolescence and then to maturity. In the young child the emotions, for example, are few and raw; as it grows new forms of emotion are manifested, bashfulness and shyness appear early, the emotion connected with the sexual urge is comparatively late in its appearance, and in between the sentiments—product of human civilization—are woven in the child's mind.

(ii) Growth is a continuous process.

There is no abruptness noticed in the development and maturity. Each stage of development during its existence prepares the ground for the next stage.

(iii) The rate of growth is uneven.

The sequential stages in the development do not maintain the same rate. Within the first year of life the child learns to sit without support, stand, reach for an object, hold it, recognize it, and express its likes and dislikes in unambiguous terms. During no other stage would the child exhibit so many changes occurring with such rapid succession. But this difference in the tempo is also witnessed in each of the mental phenomena. The rate of development of memory, for instance, is rather slow till the thirteenth year, intensifies between 13 and 16 reaching its maximum by 24.

(iv) Rate and pattern of growth are modifiable.

Such factors as food and rest, facilities for learning and security at home, go a long way in enhancing or retarding the rate of growth in the physical as also in the mental aspects. The pattern of growth would of course change according to the environmental influence. Watson was justified in claiming that 'a saint or a scoundrel' could be made out of a child if the requisite social stimuli were available from the earliest childhood.

(v) Growth is integrated.

The various aspects of physical and mental growth are interlinked. If the ability to read partially depended upon the proper functioning of the eyes, the pupil's progress in writing would depend on this ability to read, and, his comprehension would be related to the abilities to read and write. Physical boredom causes the misleading phenomenon of fatigue, while psychological impetus increases the output in the physical work.

(vi) Individual differences.

Two individuals no matter how similar environment they may have enjoyed, or possessed similar innate abilities would hardly grow in the same way. The problems related to the individual differences being important in pedagogy a separate chapter is proposed to be devoted to it.

THE PHASES OF DEVELOPMENT

The course of development may be roughly classified in the following phases:

Infancy ...	Birth to 2 years.
Early childhood ...	2 to 8 years.
Late childhood ...	8 years to puberty (about 13/14 years).
Adolescence ...	14 to 17 years.
Maturity ...	roundabout the 18th year.

Infancy

The first thing that draws our attention at this stage is the utter *helplessness* in the infants. Such complete dependence on others for its existence is never again witnessed save in the case of severe illness. It is interesting to observe that this period of dependency of the young is gradually prolonged as we ascend in the scale of evolution. The tiny butterfly as it emerges out of the pupa does not find its mother waiting upon it. The young pup is reared and looked after only for a very limited period. Whereas in the higher apes and the man, particularly in the latter, the dependency is much prolonged. Biologists believe that with the rise of the intellect and the higher mental functions among the animals the brain becomes more complex in its functions and these animals therefore take longer time in their maturity and, so, in gaining independence.

But, even during this helpless state we may notice a tremendous outburst of *activity*. This apparently purposeless activity allows the exercise of the limbs and organs and thus furthers in their development. Very soon there begins to appear purpose in the movements, and the child gropes for reaching the objects it liked, and expresses its likes and dislikes. To start with, the poor little thing has nothing to help it but its reflexes, and in many ways it feels handicapped in fulfilling its desires.* If it wanted to catch hold of the toy it makes ceaseless efforts. Gradually its movements become co-ordinated and it gains mastery over voluntary movements, and coordination of the limbs and movements are essential for voluntary actions.

The steady *development of the sense organs* offers a wider scope for the proper appreciation of the varieties of colour and sound, taste and smell which are the aids in perception, and the child's experiences are thus enriched. If at birth the child was unable to respond to the auditory stimuli it begins to do so within a few days after its birth, and within a couple of months it learns to discriminate between the sound of a toy bell and the spoon striking against the milk pot. The 'recognition' of the milk pot and the spoon of course grows out of conditioning.

These processes of conditioning are the precursors of *memory*. Appearance of the feeding bottle at regular intervals and the concomitant satiation of hunger leave a pleasant experience regarding the bottle in the child's mind. By the second month the infant's expressions indicate that it can vaguely recognize the milk bottle. These innumerable processes of conditioning also form the rudiments of *habit*. In the later stages if the child is unable to go to sleep without rocking and patting and singing of lullabys it is because these habits were formed earlier by the parents or the nurse. These are not only unnecessary habits but at times prove to be time consuming for those in charge of the baby.

It is also at this stage that the *emotions* in their natural raw form are evinced. As it has been said earlier, the child is born with three principle forms of emotion, viz., fear, anger and love. All these arise out of the basic needs governing the growth and life of the child. These emotions gradually ramify as the latitude of its experience is widened. It loves milk because it is essential for its existence ; soon it begins to love the person who supplied milk at regular intervals, and that is how grows the love for mother or the attending nurse. It likes the objects lying around and tries to reach for them, and these actions widen its experience and offer opportunities for the development of its body. This is the genesis of play activities. Playways thus turn out to be the ways for the child's education. It would begin to like the persons who would play with it and give it company. Incidentally, such little occasions also offer facilities for the gradual display of the social qualities. On the other hand, those acts which work against the natural inclinations and desires, the child would almost automatically hate and detest. It abhores being disturbed while being fed, and any one interfering with this life preservative process comes to be disliked. By nature the child is afraid of loud noise and sudden movement. If the house were noisy or situated, say, by a smithery, the child would not only experience constant recurrence of emotion but may develop signs of nervousness. Such disturbances would also contribute towards its insufficient sleep and tend to cause constant mental irritation in the child. We may thus see the interlocking of the different factors affecting the development of the child's body and mind growing into an integrated whole.

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*The grip of the reflex is so strong till the fourth month that the infant can support its own weight by holding an overhanging rod.

Life of the dependent infant gradually merges into a less dependent phase of childhood and this happens despite mother's dream that it remained a perpetual baby for her to fondle and caress.

Early Childhood

Play as we have seen is one of the most powerful agents stimulating the growth of the child. That learning does not ensue from passive state but through activity is displayed in the nature's training—the natural tendency for playing. And play now takes a very important place in the child's development. There, however, appears a significant departure in the mode of play activity. During the infancy play took destructive form—destructive from the adult's point of view, not the child's though. If the wooden cubes were placed in a neat pile before the child he would take keen delight in dismantling the arrangement. This is understandable ; the desire for construction arises only after perception in the child has started developing. Construction involves correct perception of the objects and proper coordination of the limbs and fingers, only when these have properly matured that the child could take to constructive playways. What the adult regards as destructive is nothing but ways of perceptual learning from the child's point of view.

Such activities also indicate the blossoming of the most important of the mental functions at this stage, important for educational purposes, viz., *curiosity*. One has only to observe the child's facial expressions when he closely watches the mother's movements and all that she did, and all that happened around him. Physically he has now reached a sufficiently stable state to control and can guide the muscular coordinations needed in handling objects. He now wants to find out for himself why an event happened as it did. Sugar he sees being poured in tea but not salt, but why? The forthcoming answer perhaps does not satisfy him, so he waits for an opportune moment to experiment upon his own idea with the unfortunate consequences. Why cat's tail should not be pulled? Why the chimney over oil lamp lit should not be touched? Why the black polish should not be applied over the red shoes? Why? Why? Why? And, how?

The pestering queries starting nearabout the third year of life are the best indicators of the growing curiosity. It has to be sadly admitted that the chances of the child's deriving satisfaction from the answers are slender. The reasons are manifold. Firstly, the average parents are kept too busy to meet this pressing demand. And also, no psychological significance is attached to these queries. Again the parents are usually at a loss to find the requisite medium of expression which the child could understand. And of course, they just do not know the answers to many of the questions that are put by the child. Such unhappy circumstances may contribute later towards the growth of listlessness in the child's personality. If curiousity were killed how could knowledge thrive?

It is also at this stage that his *imagination* begins to grow rapidly. The voids and gaps in the child's experience are filled in by imagination. And so this mental function is utilized in play activity. In using the empty cigarette tin as a roller the child hardly bothers about the functions of the steam roller. The act is means and end put together: the action itself is sufficient to give the child a tinge of pleasure. That he has done something new is enough for him. The significance of the roller and its purpose would develop only when the preliminary knowledge of the object was gained. The girl likewise play-acts cooking; what she cooked is immaterial till she could satisfactorily perform those physical movements which may symbolize cooking. This imagination of early childhood is not pure imagination in the sense that the child does not take the initiative of creating something new in his fantasy. It is imagination in *imitation*. In describing the acts mentioned above it would be more appropriate to say that the child is prone to imitate and in doing so it takes abundant help of imagination. The latter filled the voids in the former. Imagination of the child, however, characteristically differs in vividness when compared with that of the adult. So much so, that at times it becomes rather difficult for it to distinguish it from realities.

Aided by the thriving curiosity and in the midst of the manifold activities the child unwittingly starts to think and reason. This is to be expected. If the growing child were to benefit from life's experience he must draw conclusions from these experiences however gross these were, and these conclusions would remain stored in his mind for future use. There are two things to be noticed regarding the child's deductions. Naivety is the first characteristic. With the limited mental resources his hypotheses often seek for support in the sphere of belief. How is the sound produced inside the radio? Why, there must be a man inside there. Whence comes the rain? The clouds leak. There is thus a close resemblance between the child's thinking and that of the primitive man. Many a tribal people believe, for instance, that the eclipse is caused by some animal's devouring the stellar body. Complexities in the understanding of these phenomena are too many and the basis ill prepared for the primitive man to understand the real significance of the eclipse, so is the case of the child. With the progress in education the child grows in experience and understanding, and readily adapts himself to these influences. He forsakes the old hypotheses and takes to the newer ideas. This is the scientific way of thinking: first, observations are made, next a convenient hypothesis is built up, and the latter is tested repeatedly at the anvil of new facts and the hypothesis altered accordingly.

In the social sphere too new developments may now be expected. Egocentricity of the child gradually gives way to *sociability*. Foundation for friendship is laid down at this stage. The child is more inclined to work in a group than in isolation. If due atttention be not given to this new phase of the child's development there might arise the danger of the child's becoming street minded. With its judgment remaining unripe it may readily be influenced by forces undesirable.

Another aspect of the sociability is evinced in the growing *sense of responsibility* in the child. One thing which hurts the child deeply is the feeling of being ignored. Emotional susceptibilities being a dominant feature in the child he may feel ignored even if the facts were otherwise. Unless a friendly relationship were established between the child and his parents the latter may remain ignorant of this feeling simmering in the child's mind. He seldom feels more proud than when he is treated at par with the adult,* and relegated with some responsibility however petty it might be. He is conscious of the fact that in executing the job his worth would be proved. A mother once informally consulted the writer in connexion with her child aged four who insisted on washing his own cups and saucers; rebukes and threats had no effect on this child (as on any). It was suggested that she allowed the child to follow his own ways under the guidance of the mother. After a period of six months the writer on meeting the mother casually asked her about the child, how many articles he had damaged. She confessed with slight embarrassment that no damage had occurred. How many had *she* broken within the same period? "Oh, two or three, I believe . . . .".

Late Childhood

Abundance of psychical energy is one of the most significant features of this phase. With the gait and movement now free from clumsiness of the unaccustomed he is prepared to improve his skill in output.

This abundance of energy is equally present in the intellectual sphere. He does not relish the 'childish' explanations of the previous stage, but keenly seeks for the 'real' explanations. It is not mere curiosity but *intellectual curiosity* that he now comes to possess. He can understand why black polish should not be applied to the red shoes, and is prepared to follow earnestly the reasons behind the phenomenon of rain formation provided someone had the patience to explain him. With the addition of imagination to this intellectual curiosity he now reads and *likes reading*. A new vista of the unknown world now opens before him. Looking from this standpoint one feels a great pity that in our country there does not exist sufficient amount of suitable juvenile literature. And when such books are available, as in Bengali, the low buying power of the parents prohibits the purchase of extracurricular books. Opening of numerous public libraries, specially for the young, appears to be the only solution.

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*A.M. (Age 5 yrs.) went to live in the town GHT for a few months. When he was about to leave for his home town he was invited to lunch with one of his neighbours. He was not only the sole invitee on that occasion but in addition he was treated as an adult. This impressed him tremendously, so much so that years later whenever he tried to recall his days in GHT this event came to his mind uppermost. With pride and dignity he would recall the solemn occasion adding, "and no one else was invited. You know why? Well, I had grown big . . . ."!

This intellectual curiosity is, however, not of passive nature. The young lad is keenly desirous of using his hands. One of the reasons of the man's superiority over the animal arises out of the freedom of his hands, and the child is eager to make full use of the same. But there are very few schools providing facilities in this direction. Training in manual work is the best way of training the hands. Apart from the fact that dignity and usefulness of manual labour have yet to be appreciated in our country it is a sad fact that a very limited number of schools provide facilities in manual training. Ryburn has done a great service by drawing our attention to this acute need.[1] Though it is not a new theory to propound that man learns more efficiently through real active situations, and notwithstanding Gandhiji's repeated stress in this matter, our attitude has unfortunately altered very little. The promoters of basic education may do well to lay less emphasis on the formal aspects of basic education and more on the psychology behind the use of crafts in education. It did not matter much whether the crafts selected were spinning or ginning, modelling or carpentry, laying roads or digging ditches, till the work was of constructive nature, offered a definite goal before the pupils, and required free play of the body and mind—any plan would be worth while. It may not be out of place to add that in the new set up in our country it is apparent that the use of tools and mechanical devices are going to increase. The trend of the events gives an indication of the shape of things to come, the future citizens of India will see more of tractors and bulldozers than of spinning wheels. Therefore, earlier the schools —elementary and secondary both—provide for the means to acquaint the child with the tools and the methods of handling them would it be better for his adjusting himself in the new set up.

Striving in the child now grows a step further and he now takes delight in the *group activities*. Scouting, hiking, and working as volunteers on social occasions are some of the means through which he expresses this novel desire. But his relationship with others in the group is now slightly different from the earlier stages. The new factor of competition now enters in this relationship. If he took up a task of social responsibility it is not merely because of his sociable qualities, he is now desirous of proving his worth. This way the individuals possessing better-than-the-average merit get opportunities for displaying their qualities for future leadership.

The educational and the recreational centres now come to have a new meaning for him. These establishments offer wide scope for *social recognition,* much wider when compared to the home environs.* The group also helps in adding strength to the fidelity and morality. *Loyalty* is one of the main attributes of character, and living in the group the individual receives training in forming the spirit of loyalty. It is this spirit of comradeship that the boy will be required to maintain in his later life for healthy and harmonious living.

The group wields a great power over the individual through the medium of moral sanctions. Each group has its codes of morality, and influences in regulating the conduct of the individual members. The individual sometimes is put into a dilemma when faced with a set of moral codes diverging from those he was taught at home. In taking a decision this way or that, he has to use his own decision and discretion, and thereby his discerning capacity is stimulated. Such situations call forth for his ability to distinguish for himself what is good from what is evil, and to hold tenaciously, to the right cause.

In the group he comes across variegated characters, some of which may be appealing to him. The person who possesses most of the characteristics appealing to the young ultimately becomes his hero. This hero the boy might find in his group or may come across in any other group ; if it is in the latter a change of the 'party' may then be expected.

Physical development is comparatively slow during the late childhood stage reaching a rapid rate during the adolescence. During the last lap of the childhood, *puberty* is attained, i.e., maturity of the reproductive organs takes place. In the girls this stage is formally reached when she approaches menarchy, i.e., the period when menstrual cycle appears for the first time. This organic change brings the impelling thought in the girl that she is no more a child now. Novel types of feelings and emotions, attitudes and needs are now manifested and she is called upon to make suitable adjustments in the new role. In the boys there is however no such abrupt change, but the changes in the secondary sexual characteristics—the sign of hair growing over the lips and chest for instance—direct his attention to the manhood he is now entering. The irritation felt in the genitals often induces him to masturbate causing unnecessary fears and anxieties.

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*It may be noted that all children do not look upon the group with the same attitude. The boy whose basic desires were met at home would enter the group with a healthy outlook requisite in normal social life, he would enjoy the normal competitive spirit. But one whose psychological appetite remained unsatiated would look upon the group as a place for meeting his unconscious demands ; with his domineering and overbearing attitude he would impatiently hanker for self-display. Introduction of such an element soon would turn the group into a gang.

Adolescence

The last spurt in the *physical development* takes place during the adolescent stage. This rapidity in the growth demands cautious watching of the adolescent's health conditions. In order to keep pace with the enhanced tempo of physical growth he should be supplied with sufficient quantity of nourishing diet. That this stage of development is rather hazardous is observed from the relatively high incidence of wasting diseases like tuberculosis among the adolescents.

We now witness in him a new awakening of the *intellectual functions.* It is not only that he reasons and thinks more efficiently but these mental abilities he employs in his manifold interests. Every adolescent is as it were a potential versatile genius. The renewed exuberance of imagination, profundity of emotion, the searching mind, all combine together for the youth to bloom.

Many of the infantile characteristic we notice recapitulating in the life of the adolescent but never exactly in the same state. He is now much more imaginative and is frequently given to day dreaming ; but his *fantasies* are now woven round his own self. He is no more a passive spectator of the fairy tales being enacted in his imagination, instead, he is the feature actor in the imaginary deeds of glory. The introversion of the early childhood, as against the extraversion of the late childhood, returns somewhat differently.

The adolescent is in the quest of his *ideal.* The frequent use of such expressions as 'pure love' and 'untarnished friendship' go to show that emotionally he is highly strung. Ideal is sentiment surcharged with emotion, and, ideal is the combination of all that the individual values in the moral sphere. He desires to judge his actions and motivations, as also of others, with the yardstick of his ideal ; not only that, he desires to lead life according to the principles of his ideal. Reading of biographies therefore interests him greatly, there he seeks for the persons who had lived a life based on ideal principles.

The sentiment of *self-respect* gains its greatest ascendence during the adolescent stage and much good could come out of this sentiment were it properly utilized as an educative resource. In order to enhance his self-respect the normal healthy child would strive for his place in the class room as also in the broader sphere of the society. And for the very reasons of maintaining his self-respect the child might become wayward and move stealthily towards delinquency and criminality.

Once more the individual exhibits a tendency for dependency but of a different kind. For his guidance he now depends on principles, ideals and religion. The emotional adolescent more or less blindly adheres to these ideals—social or religious , he does not feel any use for evaluating his ideals that he followed, and here lurks a danger. Religion undoubtedly has played its part of enormous importance in the growth and development of the human civilization, yet it is not without its shortcomings.* Blind adherence to the religious dogmas may benumb the sense of discernment in the man. Care should be taken to see that the boys and girls at this age learn to pick out the good that is in religion for the guidance of their conduct, but at the same time they should try to understand why such principles have come to be accepted as good and desirable.

The most conspicuous change, however, is in the *reorientation in his feelings and emotions, particularly those pertaining to sex.*

Like the deer in the Aesop's fable watching and admiring its horns in the reflections in the water, the youth takes enhanced interest in his own self. He is keenly interested in matters related to personal cleanliness and adornment and exhibits all that is best in him or that he is capable of doing. This phase has been labelled by the psychoanalysts as the auto-erotic or the Narcissistic stage.†

Gradually he grows tired of admiring himself and begins to seek for someone else on whom he could bestow his love and affection and who also would admire him. His preference is for someone near about his own age, and belonging to his sex. If the adolescent girl dressed smartly it was for others to admire her but she would not parade her desire openly, on the contrary she would exhibit rather an antagonistic tendency towards the boys, just as a boy would consider girls to be 'inferior' and find ways for shunning their company. This stage in love for the same sex has been given the name of homo-sexual stage.* This is the age of undying friendship, unending promises of 'remembering for ever', and of writing poetry. Love for the gang or the group is not diminished, but now in the group there is always one person, or two, who for him stand apart from the rest. It is, however, true that the friendship formed at this stage is never again repeated with the same vigour at any time later in the life. This may be partly explained by the fact that intense friendship can be formed only when the emotional and intellectual make-up in the two persons bear certain identical elements, and when there are similarities in their life situation, ideals and idealism; such semblance creates better ground for understanding. Two boys suffering similar privations at home would be more friendly towards each other than if one of them enjoyed radically better atmosphere at home; on the contrary, friendship could hardly be expected to grow between two persons standing far apart in the intellectual or educational spheres.

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*Or else, there would not have been so many religions.

†This term has been borrowed from the mythological description of a male nymph Narcissus who was never tired of gazing at his own reflection in the waters of a fountain.

Maturity of the genetal organs accompanied by the free flow of the sex hormones in the blood stream creates a new tension in the individual leading to the next phase of hetero-sexuality. Boy's friendship with boys does not come to an abrupt end, but his liking for girls is a qualitatively different feeling, and he knows how to keep separate these two forms of his liking.

To begin with, the youth expresses his feelings through what is known as 'calf love'; every girl that he meets is an ideal for him. Resurgence of emotion tends in him to see nothing but good in every female form, but he tries to select one for his life partner which could meet most of his demands. It has to be admitted that the full development of this sexual stage is not clearly manifested in the Indian conditions, since there is not enough scope for every boy to meet girls intimately beyond the sphere of family relationship and even then there are severe taboos to be reckoned with. Neither is it usual for the boys and girls to choose their own mates out of their own will. Such pleasures of company denied to him he enjoys day dreaming, a characteristic feature among the adolescents.

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*It should be clearly distinguished from the actual practice of homo-sexuality. Freud, who had originally used this term, says that this innocuous liking for the same sex can ultimately be traced into the actual sexual desire remaining submerged in the subconscious mind.

Emotionally he is rather unstable and moves about like ship without anchor. Judging from this point of view it is understandable why in our older societies it was considered desirable to marry the boys and girls after they had attained adolescence.

Adolescence has been described as an 'awkward age', and 'a period of storm and stress'. Following the traditional methods attempts often are made to keep the adolescent engaged in hard work and physical games. The intention here is to use up the energy which otherwise would flow in the sexual channels. But an instinctive impulse could hardly be expected to be shut off from manifesting itself under any prohibitive conditions imposed upon it, it would come out again perhaps in a perverted form. A more sound procedure would be to seek sublimation in the varied forms of creative activity. Sex activities are more linked with creative activities than anything else.

That *æsthetic sense* is closely related to the sexual impulse can be seen in the blossoming of the desires to see beauty in things which scarcely held beauty. This impulse is manifested jointly with the acquisitive impulse in the collection of pictures depicting natural scenes, degenerating at times into collecting the photographs of film-stars. Struggling with his shortcomings and with all that he could accrue as his assets in the spheres of intellect, morality and education, the adolescent now enters the arena of life ; realities of the life drop the curtain over past rehearsals.

REFERENCE

[1] W. M. Ryburn—Introduction to Educational Psychology (Ch. V).

CHAPTER XVII

THE GROUP MIND

The role of psychologist is not that of a chemist. The mind in its functioning does not reveal the elementary mental propensities in their isolates as one might be led to believe while reading the previous chapters. Tests and measurements may show that Mr. X. Y. Zed possessed 'x' quantity of memory (if memory could at all be judged in this fashion), 'y' quantity of intelligence, his attention may be symbolically described by the value 'z' and so on. But it would be erroneous to conclude that this Mr. Zed is equivalent to Memory + Intelligence + Attention + ... It is the interaction of these psychological forces which went to make him what he is. These mental qualities are not static quantities like masses of flesh and bones, their existence is revealed only through their dynamic functioning. The individual may not do full justice to his native intellectual capacities if the requisite situation were not available, his retentive power would not remain same under different conditions, neither would he be able to show his inherent capacity to attend and concentrate if his mind owing to the then circumstances were diverted elsewhere. Clear conception of this fact would enable us to understand that living in the society is not exactly the same as living in isolation.

Functioning within the social framework man reveals many qualities which could not be manifested in his solitary living. In making this statement it is not intended to hint at those changes in man's behaviour which are the outcome of social training in politeness or the consequences of upbringing, these are conscious attainments resulting from deliberate adjustments. What is meant here is that there are certain innate tendencies which the individual manifests when functioning in a group and which may find no place in the man's mind if he were reared in complete isolation which is well nigh an improbablity. Living within the folds of the community and functioning within the social orbit man reveals features characteristic to the group. The society is knit by certain laws and traditions, social customs and moral codes, these are the cementing materials so to say. These in their turn produce effects upon the individual members. No doubt it is men who have created the society, but the latter too influences the mind of the individual members belonging to the group. And if we may remember that man never lives alone, logically it has to be concluded that all the mental phenomena are the combined products of the psychological *cum* social processes. Here are a few searching illustrations to quote from the varied types of life situations.

The young tot in the kindergarten does not show the same reactions towards the playthings when it remained in the group and while playing alone. The teacher meets with fewer difficulties in dealing with a child in the school environs than the parents of the same children at home—why should it be so? A child at home may stop crying if his mother threatened to tell his playmates that he was a 'cry baby'—why? When asked to stand up in the class to answer a question does the pupil remain oblivious of the presence of others inside the class? Would his reactions be the same when he answered the questions put by his tutor at home? A boy returns home after the school hours presumably tired and exhausted ; were he then asked to go to the market he would most probably complain of his weariness. How may the same boy respond if one of his close friends, on his way to the market, appeared on the scene and asked for his company? What may be the reactions of this 'tired' fellow if he were sent to the playfield to be surrounded with his playmates? Again, the reactions of this boy —if he belonged to class VI—would hardly be the same if he found the crowd at the playfield consisting of the boys of class X or class III. A boy coming from a backward village enters a town school and takes his abode in the school hostel ; during the first few months of his residence there, appearance of his old unsophisticated father would no doubt gladden him, but would his reactions remain unchanged after his staying in the hostel for a couple of years?

Evidently, man's behaviour in the group is not the same as in isolation. Man changes the group as also the group changes the man.

But *what is group*? It is at any rate not conglomeration of a few individual participants. And neither is the number an important criterion in constituting a group. A mob of fifty persons is something qualitatively different from a conference of even five hundred persons. The word group has two different meanings. It may mean 'number of persons or things standing together', or 'number of persons or things belonging or classed together'. Used in the latter sense this word bears a specific meaning in psychology. There must be some kind of similarity among the individuals constituting the group.

What sort of similarity may we expect? The criteria of age, sex, facial contour, complexion of the skin, or racial stock may contribute towards creating the bond, but these are not unavoidable essential prerequisites for the group to be formed. Reverend Andrews and David Hare possessed greater affinity for the Indians than with the people they originally belonged to. In the formation of a psychological group there must be unity in thinking, feeling and actions ; in short there must be a unity of purpose. A cluster of fifty Indians no doubt would form a physical group of Indians, but inside it there may exist more than one psychological group. The literate members in that group would bear greater affinity towards one another than with the illiterate members. These sub-groups could further be divided on the bases of profession, wealth, religious belief, political faith, etc. The barrier created by literacy would be dissolved if political ideology or religious faith were used as the criterion. It is then, the *identity of purpose* which is the main criterion in the group formation, it is this factor which causes the individuals to cohere together and form the group reducing thereby the separate identity of the individuals.

What is the genesis of this tendency? The reason is ascribed to the instinctive urges. The motive behind living in the group is traced to the herd instinct[1] or the gregarious nature in the man.[2] "The goal of the instinct" (the gregarious instinct) says McDougall, "is merely the near presence of other members of the species ; its impulse is to approach others especially in a group of others".[3] This explanation however needs examining more critically. One may feel somewhat surprised to read the last definition offered by a psychologist who has always maintained that our actions are purposive, whereas his explanation of the gregarious instinctive urge is rather mechanical. If 'near presence of other members of the species' were to be the main criterion in the gregarious nature of the man, in prefering between the company of the cannibals and apes he ought to select the former though a Tarzan would think otherwise. Again, it is a fact that solitary confinement has been regarded as the worst form of civilised torture, and it is agreed that a man undergoing solitary imprisonment would welcome nothing better than the company of others. But it remains to be seen whether a prisoner of the 'third degree' would prefer the company of his executioner-of-the-morrow to a sparrow at the window sill. It is not uncommon to observe a dog which is a family pet driving away other dogs approaching its master's doors and then going to wag its tail before the giver of the daily bread. In face of such facts, and these could be increased to any extent, McDougall's definition regarding the herd tendency does not appear to be universally tenable. Notwithstanding these compelling exceptions it may be accepted that the other conditions remaining favourable the living organism would prefer the company of its own species.

This desire to live among its own species can perhaps be explained better from biological standpoint. Existence of the individual is more secured when living within its own group. If at the dawn of civilization man had realized the fact, vaguely though, that his existence depended on 'sticking together', later he could see more clearly that his progress depended on his own contribution towards the pooled progress of the group. It is in this context that man selects his company or identifies himself with other members of the group. Living in the group is a biological essentiality as also a social urge. Once the desire of the former category was fulfilled human being wants to satisfy the latter. The lonely child being reared in a well to do family would welcome the company of other children no matter from which social stratum the latter were drawn. In doing so, for the time being it would forget about the comforts awaiting at home or his costly toys and the loving matron there. Judging superficially the lonely child's liking for others in general could be attributed to an instinctive urge. If however, he happened to be a school going child he would be reluctant to show preference for the company of boys who did not attend school. Using McDougall's theroy this preference could not be explained. This boy possessed many more mental affinities with the school going group than the one who did not go to school. The pet dog of the house drives away other dogs because in a way it identified itself with the master's family than with other dogs. By this identification its desires of getting food with ease are satisfied. If its needs ceased to be satiated it would look for life outdoors. If it were convinced that that house was no more a place where food and care could be had it would begin to identfy itself with the street curs. The child born in a rich family would not look for company elsewhere if its needs were met at home. Again, a child exceptionally bright would hardly have any desire to pick up playmates below its intellectual level even if they were of his own age. Instead it would seek for the company of the older boys. The son devoted to his father all through his younger days would feel the gulf between himself and the father gradually widening if the former took increasing interest in politics while his father remained as he was.

It is mainly on the basis of *identification of purpose* that the physical group is transformed into psychological group, and thus grows clans, communities, societies, associations, parties, or, crowds, gangs, mobs and throngs. In a social group the individual partially loses his identity and individuality, and subconsciously submits himself to others' mental states. This is what Nunn has called mimesis. "Mimesis", Nunn observes, "is to be understood as the general tendency shown by an individual to take over from others their modes of action, feeling, and thought."* This process of identification in different situations would change according to the shift of emphasis on the required mental factors. It may be asked for instance what is the difference between a Psychological Association and a mob. In both of these the individual members thought, felt and acted consortedly. But in the former there is obvious emphasis on thinking and acting, whereas in the latter the emphasis is laid on feeling and acting, just as an individual player in a team engaged in playing may feel and act more and think less, but at home engaged in his studies would tend to think most, act less, and feel still less.

An individual may identify himself with the group in one or more ways. The principal channels are *suggestion, sympathy* and *imitation*. These would now be dealt with separately.

SUGGESTION

When a person unwittingly accepts the idea and belief emanating from others and considers these as his own the act may be ascribed to suggestion.[4] In its extreme form suggestion in action could be observed in hypnotic cases. A person under hypnosis does not possess any consciousness though he may mumble as in dream. In carrying out the instructions in the post-hypnotic state (instructions given to the person when he was under the hypnotic influence) he does not believe that his actions were indirectly caused by someone else. He would insist that he was acting according to his own desires. If the act was found to be incongruous and inconsistent he would not

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*As a technical term it should be distinguished from the word in common use, according to which suggestion means an idea *consciously* borrowed from another person and accepted as an idea emanating from another person. In its technical sense, suggestion is an apt term when acceptance of other's idea is unconscious.

desist from arguing though he may feel the grounds under his feet slipping. But we seldom escape from suggestive forces in our everyday life. Faith in magic, charms, amulets, ghosts, totems and taboos are clear instance of suggestion. The believer may not be able to offer any convincing or rational argument in favour of his faith, nevertheless, he would firmly adhere to the belief and would derive pleasure in deluding himself that it was a 'fact' that the particular amulet which he wore was effective in bringing good luck. Once he ceased to believe in that charm he would begin to offer those very arguments which his critics had used against him and which he had sternly resisted before.

It is curious to notice that suggestions are accepted from another person only when the suggestor holds a superior position over the person who was suggested. McDougall narrates the case of a soldier of rank who was hypnotized by his immediate superior. As soon as a colonel, superior to both, appeared on the scene the hypnotized person refused to accept suggestions from the hypnotizer. Likewise a pupil in the class is apt to be less affected by the glaring eyes of the teacher-tyrant in the presence of the visiting inspector of schools. That is to say, suggestion works most effectively when the person suggested holds himself inferior to the suggestor. Another fact regarding suggestion is that it cannot withstand resistance. A conscious resister could never be hypnotized: this way he refuses to recognize the superiority of the hypnotizer. Facts of similar nature would show that a young child could be suggested by his elder brother but the latter could not be suggested, he could only be befooled. Socially speaking, it is under duress that man feels himself inferior. It is therefore understandable why one in distress is so easily duped by the sellers of charms and amulets. The latter have been observed to thrive in their trade as unemployment grew with the periodic economic depression—and also, during the examination 'seasons'.

Suggestion, then, is an antithesis to reasoning; and an individual or a group averse to thinkng and reasoning could be suggested with comparative ease. A mob could be easily led to believe an absurd idea, so absurd that any member of the crowd in his more sober moments would feel ashamed to recall the incident.

The teacher in general holds an advantageous position in matters related to suggestion. But a teacher who commanded only equivocal respect from his pupils would be in perpetual trouble in controlling his class. The question that arises is, to what extent a teacher should employ suggestion in his class teaching.

Briefly, any indiscriminate use of suggestion on the part of the teacher should be avoided; on the other extreme it is not plausible to allow democracy to run riot in the class room. It is admitted that the pupil should be granted the requisite freedom to think for himself but freedom should not be construed as anarchy. It is not possible to convince the child at every step and stage of learning with the aid of reasoning alone. As we have seen, the ability to reason and to think for himself grows in proportion to the background information accumulating in the child's mind. The young pupil in this respect is surely handicapped. In the class room teaching the pupil will come across copious cases of exceptions to the rules taught to him. If the pupil did not accept these exceptions the only alternative would be to disbelieve the teacher. In educating the child, using it in the broader sense, suggestion has to play its inevitable role.

Suggestion however may be used to the minimum extent essential for learning. At the same time, the teacher must guard against suggesting any idea or belief which is narrow in its perspective, sectarian in aim and which if imbibed would leave the child's mind crippled against realities and truth. It would suffice to recall a few of the damages already perpetrated by continued suggestions in one form or another. A veritable stream of suggestions has blinded us to such an extent that we seldom pause to verify whether it is fact that man is born so high or low that a mere touch of the latter would pollute the former; should charms of magic be permitted to have a firm hold over our mind more than science and logic; would dignity of religion be maintained if it were dragged down to the depths of vulgar superstitions?

SYMPATHY

Sympathy is sharing other's feelings and emotions. In common parlance sympathy usually denotes the sharing of others' sorrows. But sympathy in relevance to the group mind means sorrows *and* joys of others. From this point of view *empathy* would be a more suitable term to use, which means 'a mental state in which one identified or felt himself in the same state of mind as another person in the group.' It is sympathy more than anything else which distinguishes a crowd or mob from an association or a party. The academic bodies, for instance, are formed on the strength of cognitive principles. The members herein believe that their collective thinking would help each individual member. But the participants in a mob are bound together with the chains of emotion. The joint action here results more from the acceptance of others' feelings than anything else. Intense emotional drive will succeed in forming a mob which perhaps no amount of thoughtful persuasion could do. But the participants will remain adhered together till they shared each others' feeling experience. The mob would dissolve soon after the individuals began to realize that their feeling was not shared by others, or, if the threat to the members grew so intense that feeling for their ownselves became greater than the feeling they had for others. An incident recorded below would explain the statement.

A heavily laden motor truck was passing through a rather conjested area of a town. A young boy shot out of a bylane running across the street without noticing the oncoming vehicle. The driver of the truck quickly applied the brakes but the momentum of the moving truck was too much to stop it immediately. The driver certainly did his best but the lad was run over. The pedestrians ran to the aid of the child and many voices were soon instructing the driver how to back the vehicle to extricate the child. The mother of the boy was following him at a distance and reached the spot somewhat later. As soon as she saw the mutilated body of her son she gave a shriek and a wail rose in the air. The crowd which had gathered there soon fell upon the driver and many of the erstwhile rescuers now joined the throng with the result that the driver was killed. It may be noticed in this case that the action of the crowd in extricating the child's body was thoughtful and logical. But the mother's cry was the signal for all sharing mother's emotion, and intense emotion destroyed reasoning. The men did not wait to see that in sympathy to a lost life another life was being lost. Seen with the cold eyes of logic the first victim shared greater responsibility for the incident than the second. Anyway, the sympathy that the crowd had desired to show had now lost its purpose. Accidentally there appeared a police van at the scene and the crowd melted quicker than butter on fire. The solidarity in feelings now was broken because each now felt for himself individually.

All the characteristics of emotion in an individual could be observed in sympathy. There is an abruptness in the appearance and disappearance of the specific mental state, its influencing all other mental functions intensifying the conation and so on.

Nearness is an important factor in evoking sympathy. The emotional upsurge in the people related in the above illustration would not have been so strong had they instead read about the accident in the paper.

But the geographical nearness is not of great importance. Psychological proximity, nearness in the feeling is of primary importance. The reaction of the bystanders who did not belong to the town, where the accident had taken place, or of the newcomers would have been different from those who belonged to the town, and still more different among those inhabiting in the locality. As a matter of fact this emotional affinity is the basis of all chauvinism and provincialism, as also of patriotism.

Generally speaking, affinity is greater for those persons with whom the individual has been associated. Mental contact is more important here than mere physical association. Emotional, intellectual, religious or cultural association creates a deeper bond than physical proximity. The bond grows proportionately weaker with the increasing mental difference amongst the individuals. One great contribution of science is that it has helped to reduce the distance, the world has become much smaller. Facilities, communication and news transmission have greatly removed the barrier between the distant countries. Opportunities are now available for the people to enjoy closer contact with one another than ever before. Man can now hardly ignore what happened to the distant regions on the globe. A strife between two countries stands a good chance of being transformed into a global war. Economic upheaval in one country sends its repurcussions all over the world. Man can not afford to live alone. Nearness has also grown in the relationship of man and man inside the country. In the democratic countries each individual is a part of the state. Each man and woman has responsibilities and duties towards the people of his or her country and the world. We cannot afford to ignore the feelings of others. And it is so much the better that the world is made safe enough where we can share the joys and sorrows of one another through sober assemblies than when fashioned by a mob. Let the assembly spirit be encouraged and not the mob spirit. But this could not be expected to grow spontaneously ; patient and consistent training is essential. Let each child be trained to get out of the rut of narrow selfish interests or affinities bound by narrow limits. It is through the participation in the joys and sorrows of others in the broader sphere of life that a healthy outlook could be fostered in a group. It is a happy sign that even school students nowadays are found to collect their pies and contribute their mite to ameleorate distress of their fellow countrymen. This attitude was hardly known, or little encouraged, in the not too distant past. It is through such sympathetic participation that the largest group in the country—the people of the country—would be benefited.

IMITATION

Imitation is the conative aspect of the group mind. By imitation the person acquires others' way of doing, it is a superficial method of identifying oneself with others, not in knowledge, feeling, content, but only in form that the person believed he was someone else. In this act only a specific aspect of the person imitated may be selected, or even the person as a whole may be imitated. The child in covering his eyes with a piece of paper bearing two holes may imitate only one feature of his father, viz., of wearing spectacles. On the other hand, he may try to imitate simultaneously several aspects believing himself to be the father. The difference lies merely in the attitude adopted in imitation.

Imitation, again, may be conscious or subconscious. Admiration for the poet Tagore has led many people to imitate his handwriting though not in all cases was the imitation conscious or deliberate. It is in subtle suggestive ways that such habits begin to grow. Most of the unconscious imitations grow more out of imitating the person as a whole than any particular feature in him. The most liked teacher would be imitated in manifold ways by the pupils though they may not be aware of it. Most of our learning processes, however, start with the conscious mode of imitation. Holding the pen, writing, diction and intonation in reading, drawing and playing, all begin with imitating the teacher or the trainer.

Is imitation then a desirable process in learning? The answer could not be in the simple affirmative or negative. Assumedly learning starts with sheer imitation, also, learning necessitates practice, and practice of something which the learner has observed or heard. The difference between practice and imitation is that in the former the individual makes effort to reduce the errors, whereas in imitation his attention is directed towards the reproduction alone. What is more important is correct imitation. A pupil would write as easily a good hand or bad by imitating ; so, it is all the better that he imitates good handwriting.

But what is beneficial at the initial stage may not prove the same all through. If a child remained unable to write a word in the absence of the copy book model imitation for him had done no good. He should be gradually weaned out of the tendency of depending on other's effort and trained to use his own resources and only then the best in him would flourish. For appreciation of good literature it may be profitable to start with the imitation of mid-victorian style in poesy, but it would adversely affect the pupil's own style if the imitation were allowed to continue too long. It is the teacher's duty to detect the pupil's originality and give proper impetus for its growth and development.

SUMMING UP

Life of the individual is inextricably mixed with the society in which he lived. Apart from bearing his individual existence the personality of each bears the stamp of his society. To educate the young torn away from his group is unthinkable. Unfortunately very little has been done in educating our youth for their adjustment in the group life. The doleful effect of this neglect would stand clear in the mind if we remembered that the very conception of democracy is based on the existence of the group. This fact has special significance for India where the lives of three hundred millions have now been directed towards a new way of living. In face of the fact that we may not expect pupils to learn mathematics or history all by themselves it would be difficult to conceive how they could learn about the democratic way of living in the absence of well planned training. The social virtues of co-operation and free play, justice and charity, mental discipline and civic conciousness, to name a few, are the outcomes of corporate living. But very few opportunities are available to the boys and girls in this country to taste the joys of community living. Combined with the facts that children by nature are eager to learn and learn better in group, the teacher would encounter the least difficulty in imparting training of the social qualities.

Learning is acting, acting in a novel situation. To train the child in matters related to citizenship a situation has to be created for the youth to imbibe the social virtues. This could be done through various means. Staging dramas, organising school exhibitions and charity funds, holding parents' day, arranging festivals, outing, hiking, debates and recitals are some of the simple ways waiting for exploitation. Each school could raise its own volunteer corpe to aid the organisers of the notable social functions in the town. Methods for training in the art of corporate living could be introduced even in the routine life of the school. Prefects and monitors in each class could be selected every month by the pupils themselves, or else, each student might be given a chance for a fixed period. The annual report should incorporate remarks regarding the pupil's social activities during the term. What is intended here is to draw attention to the necessity for evolving ways of corporate living for bringing better homogeneity among the people. It is through such social participation that one would understand the meaning of the expression Indian.

It is in the group that there throbs the heart of democratic civilization ; careful nurturing is therefore a prerequisite for saving democracy. Also it is the group which is the breeding ground of social rot, especial care of the group, therefore, is a matter of life and death to the society at large.

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[3] McDougall, W.—Outline of Psychology (p. 154).
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CHAPTER XVIII

INDIVIDUAL DIFFERENCE

A class room may be selected as a perfect example of the law of unity in diversity. Each class consists of a number of boys and or girls of seemingly similar age though not of the same age, of similar intellectual level though two pupils may seldom resemble, of varying taste and aptitude, coming from differing social and home environs, and yet all are treated and taught as if one of them represented the rest. Each bears a personality of his own, has his own destination in the path of life and in these respects no two pupils could be considered identical. The teacher teaches the class as a whole and yet he is expected to teach each individual. He assumes that each student would be benefited by his teaching, but this he only assumes, and he has to. Could it be inferred thereby that the teacher fails in his duty if he is not capable of bringing about any uniformity in the pupils' mental pattern? Should he be expected to forge all in the same mould? Do the parents expect this sort of uniformity in their children?* It would then become a dull world indeed.

The democratic principles of education are well represented in the single statement of Nunn, "We insist that we do not seek to change the unchangeable conditions of human existence but merely to make the best use of them."[1] The fact is here accepted that there are certain unchangeable aspects in the child which he inherits from his parents and the forefathers as there are other aspects more malleable. The teacher's function is fulfilled if the latter are moulded as they ought to be and in this matter he is to make the best use of the former. A pupil born with intelligence far below the average could hardly be trained to enable him to compete against those who were more fortunate in this respect. But it would be no minor achievement on the part of the teacher and the parents if this child could be saved from turning into a criminal and taught to lead the life of a common but decent citizen. An Intelligence Quotient of 80 could by no means be changed to 120 but the individual could be prevented from acting in a manner which would be harmful to himself and to his community.

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* Ironically enough, each pupil is supposed by his parents to be *the* ideal, they would rather prefer that *other* boys followed their prodigal son, and never *vice versa !*

On the other hand, I.Q. of 120 would not necessarily confer upon the person all that was good. Lack of interest, and therefore, of concentration, together with meagre understanding in an intelligent pupil may compel him to lead a life of mediocrity just as possession of wealth by itself does not endow the person with any philanthropic motive. Man then is at the mercy of what he has inherited in the shape of his abilities and capacities and what use these were put to when he was young.

Summing up, man is believed to be born with certain differences in the physical as also in the mental sphere. In any educative process differences in these directions are recognized and we strive to bring about a minimum amount of unity essential for a balanced growth. This endeavour on the part of the parents, teachers and the society is particularly made in the mental direction than in the physical. The teacher therefore is faced with two problems. First, he asks himself, which is of greater consequence to him, the hereditary assets and liabilities in the pupil or the influencing environment; how far the individual differences may be attributed to the hereditary factors and to what extent they are related to the environmental facilities and handicaps. Secondly, since the teacher is more concerned with the psychological aspects of the child (though the physical aspects are not to be completely disregarded) which of the three mental elements may be expected to bear larger responsibilities in the growth and development of the individuality of the child? Answer to these queries would enable the teacher in formulating his own principles in education.

We may consider the second question first. Out of the three kinds of mental experience, viz., knowing, willing and feeling, each shares a part of the responsibility in building the total personality of the individual. A person differs from another in respect of his cognitive, conative, and affective capacities. It is the quantitative difference in these matters which goes into creating the individual difference. But, it may be questioned, if these differences are of such wide nature as to be able to create the significant difference that we witness between two persons. Intelligence no doubt varies from one person to another, but could the magnitude of variation be so great that it could be attributed to be the main factor in the individual differences? The answer has to be in the negative. True, there are cases of geniuses and dullards, but such extreme cases of distinction are not frequent. Millions are born within the range of I.Q. 90 and 110, but the difference of a point or two on the scale of intelligence testing could hardly be called a significant difference, and yet seldom two persons possessing even the same intellectual calibre would resemble each other in their mental make-up. So it could be said of the affective aspect in the man. Of the two persons bearing similar emotive patterns one may readily bestow it upon the broader conception of humanity and lead a religious life or life of a social worker, whereas the other may feel concerned solely of his family; one may take to painting and turn to be a Michael Angelo whereas emotion in the other may direct him to the paths of Louis Pasteur. So could it be said about the conative aspect.

It is the combination of these three elemental functions of the mind which ultimately determines the individual differences. Two persons of equal calibre in intellect and emotionality, as inborn traits, would react differently if they differed in their willing capacity; one may move on the path to his destiny with dogged determination while the other may fail to achieve anything significant because of his lacking in will.

But the potentialities of intellect, emotion or will would all be wasted if the individuals were not taught how suitably they could make use of each. Whether the intellectually superior person was going to earn the reputation of a scientist or the notoriety of an artless criminal, whether the highly emotional person would spend his energy into hystrionics or in hysteria, or whether the person with tremendous will would turn into a determined soldier or a revengeful beast would be determined by his education that he had received and his social heredity, and these are ascribed to the environment. And, teacher is a part of the environment.

When do the environs begin to take effect? To answer this problem it has to be looked from biological as well as psychological points of view.

After the ovum is fertilized any change that may be introduced in it might have its effect on the development and maturity of the ovum, but this change would be ascribed to the environment and not to heredity. If a pregnant mother met with a serious accident the baby may be born deformed. This deformity though caused when the baby was in the womb would be ascribed to the conditions in the *internal enviornment,* more briefly, it would be called *congenital* defect.

Environment in its common meaning begins to produce its effects after the baby is born. Now onwards the environs would cast upon the individual their effect in multifarious ways. Not all would have the same consequences, neither would the hereditary gifts be thereby silenced in their functioning; but the combination of the changing environment would produce pronounced effects in moulding the individuality of the person. Some of the important factors in the environs may be discussed here.

After the birth of the baby the greatest impact it faces comes from the immediate environment of the *family*. Due to its inherent plasticity and rapid development the child quickly imbibes what is offered by the family environs so much so that during the first four years the core of the child's personality is formed and the important basis of the individual difference is now ready.

It is often that parents in narrating the difference in the behaviour of their children start with the well known expression: "You see, both the sons we have treated equally, but . . .". An efficient observer should not be put off with this simple though dubious *but*. Factually, no two children ever get the same treatment from their parents, less so by the other members of the family, the neighbours, friends, etc. Psychologically, by equality in the environment is meant equality in *every* respect to the minutest details and during every minute of the child's existence. Obviously, no two children could possibly be treated alike. They could not be reared like experimental guineapigs for psychological investigations. As to how such disparity grows may be seen in the following illustrations.

Would both children receive the same amount of attention if one were tall and the other short in size, or, one constitutionally weak and the other robust, one fair complexioned and the other swarthy, one smart and quick than the other, one clinging to the mother and the other to the father . . . ? And a multitude of such variations could always be discerned if the children were viewed objectively, and to maintain such an objective attitude in the course of the everyday life is rather difficult if not impossible. Such differences in the attitude and outlook are usually expressed in a very subtle manner. Even when the parents restrained themselves their likes and dislikes may be unconsciously expressed. And, as for the children, even a slight deviation from the usual gesture or the expected behaviour in the parents are not left unnoticed by them, even may be magnified with or without justification by the egocentric mind of the child. Thus are prepared the nuclei for the future complexes which could ramify to an indefinite extent under the influence of the growing environmental conditions, or on the contrary, the complexes may be straightened out under more favourable circumstances. Of the two brothers the one who possessed superior intellectual make-up may grow vain and the other may develop frustrated obstinacy which may further deteriorate if the first child looked down upon the second. On the other hand the second child may start pleasing the parents if it found obstinacy of not much use and this attitude would ultimately thwart his personality and make him timid and submissive.

The child who showed comparatively more mental alertness would be given larger share in responsibility and consequently would mature quicker though at the cost of his brother who would accrue comparatively little experience in doing and thinking for himself. The eldest child in the family usually holds a superior position by virtue of his maturity. This early maturity itself becomes an important factor in creating individual differences. As far the parents are concerned the youngest child hardly grows for them, the mother desires his infancy to linger so that she could fondle him a little longer. There is no dearth of the youngest children in the families bearing the nickname 'baby'.

Then there is the problem created by sex difference. Difference in sex does not produce any inherent intellectual difference among the boys and girls. Emotionally too, the difference does not arise before the advent of puberty. But there are inexhaustible modes of difference that are maintained in the respective treatment of the boys and girls in their everyday life. Is it not that in presenting toys to the children we often make discriminations? By presenting with sets of miniature utensils and furniture to the girls and sports outfits to the boys we lay the foundation of the characteristics they would show in their later behaviour patterns. Out of a boy and a girl whom do we usually take to the field to watch a football match—evidently the boy. Is it not that girls are preferred to accompany the mother and the boys encouraged to accompany the father if a situation arose? Again, don't we dress them in radically different manner after a year or so of their infancy? In the matter of reciting tales to the children we usually select for the boys stories with renowned male characters and for the girls such as of Seetā or Sāvitri.

On more than one occasion the writer has heard with no little amusement mothers laying varying emphasis on the male and female characters in their stories. A story may begin with: "There was a king and queen . . ." But in reciting the tale to her son unconsciously she portrays the picture of the king playing a predominant role while the same story when retold to the girl would show the king painted as a mere prince consort!

As children grow they are sent to school, and there they are received in a completely new environment requiring fresh reorientation in their adjustments. Incidentally, the parents tend to show more concern for sending their sons to school than their daughters.

The number of children in the family, also, contributes towards the variability in the individual make-up. The only child in the house would be liable to get better education than if there were many. And certainly the socio-economic circumstances prevailing in the family would play a significant part in the choice of the school, in engaging home tutor and satisfying other psychological needs in the growing child.

After the family the *community*—consisting of the friends, neighbours and distant relatives—produces its influence. But before the impact is fully felt by the child he is sent to *school* which actually forms the most important constituent in the envionment after the family.

The teachers though are expected to look upon the pupils without any bias and treat them equally, it may be reminded that they too are susceptible to the human frailties. We are apt to like those who bear certain resemblance with our own likes and dislikes. Such preferences are liable to be expressed unconsciously and despite the teacher's efforts to maintain an unbiased outlook.

Apart from such factors, the pupil himself would now contribute towards the growth of his individual personality. At the beginning of the session, for instance, the class may start with the presumed equality of the pupils' native intellectual capacity. But a bright student by the end of the year not only matures more than a dullard but, also, more rapidly. The rate of development in the two will be different. A pupil progressing at a rapid rate of development assimilates what he was taught much more and quickly than the less bright. The effect of this assimilation is not limited only to the school subject but affects his general maturity in respect of the integrity of his personality.

But learning does not depend on the intellect alone; interest is an important factor to be reckoned with. Interest is created not only due to the ability of the teacher in making the subject interesting but, also, on such factors as the need felt by the pupil to learn it, balanced competition inside the class, etc. For instance, two equally meritorious pupils will provide impetus to each other, whereas a bright would leave a dullard more conscious of his inaptitude.

The school situation is, however, unexpectedly new for the pupil for another reason. For the first time an individual is called upon to adjust himself and modify and regulate his behaviour and conduct. But this adjustment could not be similar in all cases. For example, in one case jealousy may cause more activity in the pupil, while leaving another cold and inactive though both may act within the bounds of discipline. Social recognition the pupil has now to attain for himself, would not come of his being the only son in the family, the eldest or the youngest son of the parents, or due to the fact that he was born amidst plenty. He has now ample scope for exposing his potentialities but these can be achieved only in harmony with the encouragement he receives at home and in the school. The pupil would evince one type of reaction if his home and school conditions were complementary, and another if these were contradictory. The school helps to provoke his thinking and reasoning and the co-operation forthcoming from his home would result in keeping up to this trend. On the other hand, a boy coming from a backward region or from a very conservative family on entering a progressive school would develop the belief that the ideas ingrained in the school should better be left within the school compounds; he would hardly find any relevancy between what he had learnt in the school and his actual experience at home. A boy coming from a home enjoying reasonably rational outlook would find meaning in the lessons in hygiene, whereas another lad coming from a very orthodox family may learn the lessons by heart but would consider these as fads of the text book writers. These two boys later in their life would develop completely different outlook on practical life and science.

With the development of the child his community and the society exert progressively greater influence upon him. The society beyond the school and outside the home now would draw his attention. What he listened from his relatives and neighbours, what he read in the newspapers, witnessed on the streets and the market places would constitute a large segment of his experience and a new aspect of his environment. These now come to possess an important bearing in face of the changing world now changing faster for the lad. Finding a better scope for expressing his youthful exuberance the individual would develop into a healthy minded alert citizen, while the absence of any fruitful channel of canalizing his interests and activities the potentialities in him would be damped and he might turn into the common but pathetic sight of a listless man more dead than alive.

Summing up, the home, school, and the community form the three main foci building the child's environment. He receives his mental nourishment mainly through these sources. Varying conditions therein would produce different reactions in the individuals. These three aspects, however, are bound to produce variegated influence when we take into account the unlimited possibilities of variations caused by the differences in sex, religion, socio-economic conditions, varying shades of cultural atmosphere in which the child was reared, his special abilities and disabilities, etc.

EDUCATIONAL IMPLICATIONS

Mystery of the individual differences would be removed if we accepted the fact that growth is a resultant of forces possessed by the individual and in his environs. The new born infant is a bundle of innumerable innate factors in the domain of physical and mental development. When these act upon the child and in their turn are acted upon by the innumerable environmental conditions the outcome in the possibilities may be described as infinite.

The teacher in facing his duties has to encounter a rather curious position. On the one hand he has his duty of moulding the individual pupils according to a general social pattern. On the other hand, any use of force made while ignoring the incompatibilities in a specific case would only lead to disastrous consequences. Two children, for example, would not react similarly to the same stimulus of reward though reward in itself may have its values. Equipped with this general knowledge the teacher has to proceed with tact and caution and consider each case at its face value.

Education cannot be compared with the mass manufacture of commodities. The teacher and the parents are obliged to consider the varying shades of difference in the individuals. If psychology as a science tells the teacher what method may prove fruitful, the teacher has to find out for himself when the rules are to be followed, or else, one man's food may prove to be another man's poison. In this matter the teacher shall have to fall back upon his judgement and initiative—these are the requirements of an artist. In order to bring about the best in music or painting it is left to the artist to decide whether he should give a light touch to the bar of notes or the colour, or treat it with emphasis. This unavoidable importance attached to the subjective judgement of the teacher tends to make teaching an art. It is the function of the teacher to teach the class as a whole, nevertheless, like a good leader of an orchestra he must be on constant guard to detect which corner in the class room has failed to reflect his efforts, which pupil, and why. He should remain watchful whether he was using his psychological knowledge in education in a mechanical way or judiciously. It is on him that depends the maintenance of unity in diversity.

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[1] Nunn, T. P.—Education: Its Data & First Principles, p. 8.

CHAPTER XIX

EXAMINATION

A CRITICAL REVIEW

The primary function of examination is to check up the pupil's success in learning. The extent of progress revealed will decide whether it would be advisable for him to proceed for the next stage in learning. This procedure has been in vogue since time immemorial ; examinations had their specific functions in ancient Greece and Rome, China and India, though their forms varied from one country to another. In China for instance the pupils on finishing the course of study were kept in isolation and required to write down all that they had memorized, evidently no distinction was made between learning and sheer memorization. In ancient India examination perhaps was not so much of an ordeal but a ceremonial occasion.

In view of the existence of varied kinds of examination each needs be evaluated before any final choice was made. Henceforth we will refer to the method of examination prevalent in the educational institutions as the *classical* or *essay type examination* because it requires the examinee to adopt the style of essay writing. Since all the modern methods of examinations have evolved out of the essay type examination, and as the latter is the oldest among the existing methods it would be in the fitness of things to evaluate it somewhat more critically.

Analysing examinations we find that the examiner is faced with two broad problems ; he is required to watch whether the answer covered all the issues raised in the question, this aspect in the examination may be called the *content* or the subject matter for examination. Next is the problem of *form* or method adopted in answering. It is presumed that the examiner being aware of his responsibilities pays due attention to both of these aspects in examining the scripts or in the oral answers. In other words, he should not allow himself to be influenced by one of these alone while examining the other. It is the intention of the examiner to find out the extent of progress made by the pupil in the different aspects in learning, viz., with regards to the comprehension of the subject matter, retention of the facts, expression in reproducing, application of the acquired knowledge in novel situations, etc. It may be questioned whether the expectations are fulfilled. In fact more often than not the examiner is liable to give high marks for the content by virtue of the commendable form. A poor script is liable to receive high marks by virtue of the impressionable form adopted in writing, on the other hand, a commendable answer may fail to draw attention of the examiner if the handwriting were not legible or if the examinee happened to be careless in his expressions. Such anomalous situations often result in deceptive judgement.

Again, it becomes difficult sometimes to get rid of the psychological factors which hinder against one's taking a completely detatched view. Previous acquaintance of the examinee does tend to create a bias as also is the fact that the existing mood of the examiner and his natural temperament would very likely be reflected in awarding marks.

That the marks awarded in an examination are not always a reliable indicator of the pupil's accomplishment is an accepted fact and this has been proved by more than one educationist and psychologist. The following example (quoted here from the writer's experience) is a typical case. Five intending teachers were asked to mark separately the answer scripts of pupils of matriculation standard, the questions being set from the prescribed syllabus in English and Asamese language, and the total marks for each of the two questions were fifty. Each examiner marked the same script on two days with an intervening period of about seven days. The marks awarded on the first day were kept with the writer along with the scripts which bore no marks to recognize the examinees, in all other respects the usual methods of examining answers were followed. Results obtained from examining two scripts are shown below.

Examiner	*Marks awarded against the Assamese script on*		*Examiner*	*Marks awarded against the English script on*	
	20.7.51	*26.7.51*		*20.7.51*	*26.7.51*
A	29	26	A	15	7
B	28	21	B	22	11
C	18	13	C	10	5
D	31	19	D	18	13
E	26	14	E	13	6

TABLE 5

Evidently there is not only lack of unanimity among the different examiners but no examiner repeated his own award when called upon to re-examine the same script. Lest such an outcome may appear rather fantastic, we may refer to a few of the standard investigations made in this direction. Starch and Elliot had asked 116 high school teachers to examine a geometry paper and follow the usual practice in scoring. The marks varied between 28% and 92%.[1] Boyd gave 26 answer scripts in essay writing to 271 teachers requiring them to give their opinion according to certain specified grades. Almost all the scripts bore varying remarks, e.g., one script was marked Excellent by 3 examiners, Very Good by 111, Good by 153 and Moderate by 4.[1] Similar results could be quoted to show the variance in marking by the same examiner on different occasions. Lack of reliability obviously is the fundamental weakness in the essay-type of examinations. This is bound to be so in view of the fact that the value of marks is not rigid but elastic. An inch on the foot-rule will invariably occupy the same space but the values of the marks will be very much influenced by the subjective likes and dislikes of the examiner. A script may not be expected to be reviewed by the examiner in the same spirit if he were in a happy frame of mind or when he was perturbed. The scale of hundred marks then becomes like an elastic tape used for measurement—sometime streched and relaxed at another time. However, this is not the only shortcoming of the essay-type examinations.

When a question paper contained five questions each carrying equal marks it is presumed that all the questions were of equal difficulty. There is no way to judge this presumption. For example, 10 marks in the questions I and II, though are reckoned of the same value could not be treated alike if the first question were more difficult or lengthy than the other question.

Again, the questions usually are expected to cover the whole course of the subject taught and yet to satisfy this criterion in examination it is well-nigh impossible. The result is that chance plays a considerable part in framing the questions: if the question paper appeared to be stiff for one examinee and easy enough for another the difference at times may be ascribed to 'luck'. And, these constitute only a few of the criticisms that could be levelled against the prevailing system of examination.

The shortcomings in the classical examination may then be summarised in the following. There is no way to find out whether the questions selected formed a representative segment of the total subject matter, the questions were of equal merit, the examiner in judging the content of the answer was not influenced by the form, the examinee had really understood what he wrote or relied upon cramming to books and/or notes, and, whether the examiner could maintain objectivity in marking the answers.

NEW EXAMINATION

Such defects have led the pedagogists and psychologists to seek for a more reliable method of examination. This is the origin of what sometimes is referred to as the *new type examination or objective tests.*

The specific features in the objective tests are as follows:

(*i*) The tests are so constructed that there may be no scope for giving an ambiguous or indistinct answer. Thus the chances for an examiner to be influenced by the form in judging the content are much lessened. The examiners on their part are expected to set specific and clearly defined questions leaving little room for language dexterity. The samples given below show how questions may be prepared to assess the psychological abilities of comprehension and memory in learning subjects like history, geography, language, etc.

I. *Direction:* Read the following paragraph cerefully and *cross out* the words wrongly spelt; *underline* those which are grammatically incorrect.

"The East India Company had grown steadily throughout the century and by 1740 had a capital of £3,000,000 on which a dividend of 7 per cent had paid to the shareholders. But this represented only a small part of the profits taken from India. It was the practice of the company to pay its servants only a nominal wage; their real, and in the higher grades vast incomes were derived from bribes, extortions and private trade. The Company kept a monopoly of the trade between India and Britain but left the internal trade entirely to its servants. Clive once stated that the temptations held out to adventureres on that part of the globe were such as flesh and blood could not withstand. Even the Directors of the Company were forced to condemn a system which they themselves had created and which finally threatened the profits of the shareholders. They complained of the "deplorable state to which our affairs are on the point of being reduced, from the corruption and rapacity of our servants, and the universal depravity of manners throughout the settlement . . . . We must add that we think the vast fortunes acquired in the inland trade, had been obtained by a series of the most tyrannic and oppressive conducts that was ever known in any country . . ."

In answering the following questions *put a check mark* (√) over the correct answer.

1. East India Company had helped India to grow free trade with Great Britain ... ... True/False
2. East India Company which was started by the British merchants was also condemned by them ... ... Yes/No
3. The Company was blamed for making no profits ... ... Yes/No
4. This Company did not exist during the first half of the XVIII century ... Right/Wrong
5. Clive defended trade with India through the East India Company ... True/False

II. *Underline* the appropriate answers in the following:—

NOMINAL means LARGE, BROAD, SMALL, TRUE.
MONOPOLY means LITTLE CONTROL, COMPLETE CONTROL, A LITTLE CONTROL.

Some may doubt the possibility of constructing such tests in subjects like mathematics. The following is a sample from a series of objective tests in geometry.*

III. *Direction :* In the following theorem the statements leading to its proof are given in the first column. These statements though serially numbered are placed in a wrong order. If these steps were carefully rearranged the theorem would stand proved. Read the statements in the first column, take help of the diagram in the second column ; and then arrange the steps in the third column ; e.g., the statement No. 3 in the first column should come first in the third column, so, write 3 within the brackets before the words "comes first". Now proceed.

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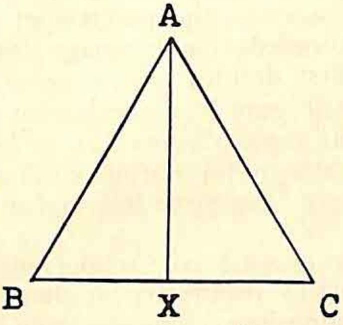
* The writer acknowledges with pleasure the valuable suggestions received from Sri Sarat C. Dutta now of the Teachers' Training Dept., Calcutta University, in devising these tests.

Theorem: The angles at the base of an isosceles triangle are equal.

Given statements	*Diagram*	*Statements rearranged to prove the theorem*
(1) $\angle BAX = \angle CAX$ (2) $\angle ABX = \angle ACX$ (3) Bisect $\angle BAC$ (4) $\triangle ABX = \triangle ACX$ (5) AX is common to both (6) $AB = AC$	 FIGURE 26 (a)	(3) Comes first ( ) Comes second ( ) Comes third ( ) Comes fourth ( ) Comes fifth ( ) Comes sixth

(*ii*) The system of marking in the objective tests is comparatively simple. If the answer be correct one mark is awarded or else no mark is given, and since there is no scope for dubious answers its correctness or incorrectness is guranteed. Thus the examiner is saved from the vexations in deciding whether he should give 4, 4½ or 5 marks. Also, the reliability of the pupil's standing now becomes well defined. These matters are of great consequence when there arise such problems as in the awarding of scholarships or rewards against the result of examination.

Further advantages. (*iii*) A large number of such tests could cover a much wider ground in the subject than it is possible with the use of comparatively fewer answers of essay type.

(*iv*) With very little writing to be done the disturbing factor of fatigue is greatly reduced.

(*v*) Correcting the answer scripts requires comparatively little time.

(*vi*) The tests in a subject could be transformed into a scale.

What is a scale? It may be defined as a measuring device requiring two limits—one at the upper end and the other at the lower end—and the intervening space divided into equal units. This definition is applicable to any system of measurement. A scale of educational tests may be used to determine how far the pupil had achieved in that particular subject, as also, the position of the individual among the pupils of not only in his own class but among the general run of pupils of that grade.

In the preparation of a scale of tests presumably the subject matter must be clearly defined. If essay type examination be intended to assess the progress of the pupils in the acquirement of 'knowledge in language', to use achievement tests it must be first decided which aspect of language was designed to be tested, growth of vocabulary, comprehension of statements, factual memory, etc. Let us consider a specific subject matter—a design for testing vocabulary for instance. What principles may have to be followed in preparing a scale in this subject?

In teaching language in the school one of the objects is to increase the pupil's vocabulary so that he may be better equipped in his expressions. The text books in language help the students in progressively increasing the total vocabulary each year. It is possible to prepare lists of simple words with which the pupils were expected to be acquainted after spending a year in each class. Suppose 100 such words were selected and arranged in order of assumed difficulty, i,e., beginning with the simplest ones which all pupils in Class I might know and ending with the most difficult ones in the series which seldom any pupil in Class X could understand.

Afterwards, these words should be applied on a large number of students of the classes under consideration and a final selection made regarding their suitability as a reliable scale. To achieve this end we would have to seek aid of statistical techniques to determine how many of the words an 'average' of each class was acquainted with. If, for instance, it were found that an average student of Class III was familiar with 30 words in that series of 100, this number would be a reliable indicator of the pupil's achievement in vocabulary at that stage. Applying the finished scale, later on, if it were found that two students of Class III knew 22 and 36 words respectively, it may be then deduced that the former is backward and the latter brighter than what should be expected at that grade. But these expressions of backwardness or brightness would be applicable by using this specific test only in respect of vocabulary and in no other educational aspect. It may be noticed incidentally that the factor of age here is ignored. Any way, when the vocabulary is finally determined based on the principles mentioned above the scale would be considered ready with its *norm*.* In the above illustration since the norm was determined against grades it would be called a *grade norm*. If the pupils of only one school were used for devising the norm—though in practice it is not done—the norm would represent that particular school and the scale could not be applicable to any other school. If, however, a wider norm was desired—and this would be appropriate—samples of pupils from various schools would have to be included in standardizing the test.

The meaning of the words test and scale should be clearly distinguished. An objective test simply is a device for examining a candiate in a subject with the intention of avoiding the shortcomings inherent in the essay type examinations. At the most it could be considered as a reliable technique in examining. These tests, however, could be arranged in graded difficulty and thus transformed into a scale for the specific purpose of measuring a candiate's educational accomplishment. A scale of tests may possess different norms for the respective grades or classess, and its application may show whether a candidate had reached the educational maturity requisite to the grade, if not, to what extent he might be lagging behind. Such a precision in statement is not possible to make with the aid of the marks in the essay type examinations.

(*vii*) Objective tests could also be constructed with the specific aim of diagnosing the disability in the pupil in a particular subject. This the ordinary examination could seldom achieve. The classical examination may reveal whether the pupil required further instructions in grammar, needed more practice in handwriting, whether he had understood the story or the theorem, memorized the poem, etc. But it could not tell us why the pupil had failed to achieve if he did. If he could not prove the theorem was it due to the weak foundation that he had in geometry or because of any particular type of error that he always committed in solving the problems? If he proved backward in grammar was it because of his ignorance about the rules or his inability to apply the knowledge, and so on?

In order to use the objective tests for diagnostic purposes, first of all the subject matter itself has to be analysed into the

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*Here the difference between the *norm* and *standard* would become apparent. Norm represents the average result. The norm of the class VI in school A may be 55 words, and of class VII 83; whereas, the norms of the same classes in school B may be 48 and 78 respectively. In that case the standard of the school A would be said to be higher than that of the school B. This however is an imaginary case for illustration.[2]

basic components; the different steps constituting the learning of a subject should first of all be determined and then tests employed to test each aspect separately. Let us take the case of simple arithmetic. We tend to forget that multiplying 387 by, say, 86 is not a simple process to be achieved by a single step, but it is a composite of several successive steps. It requires intimate knowledge of the multiplication table. After multiplying 7 by 6 the product has to be broken into two, the right hand figure to be written down, and the left hand figure to be held in mind; the latter capacity is the function of immediate memory whereas the ability to remember and recall the multiplication table is a case of remote memory and a person good in one may not prove equally good in the other. However, if the pupil were handicapped by poor retentive power of the immediate variety he may forget to add this 4 to the product of 8 and 6, this would be his chief weakness in multiplication. This particular pupil would then require further training in this aspect after which he would quickly improve in multiplying. Thus we can see the objective tests serving as useful tools in the analysis of the varieties in the defects in learning. Once the pupil's common weaknesses were spotted, *i.e.*, diagnosed, more planned and determined efforts could be made in rectifying these.

DISADVANTAGES

We have discussed uptill now only the bright side of the new type examinations, and it looks like too good to be true. As a matter of fact there has now come to exist two distinct schools regarding the utility of objective tests in education. The over-cautious may whisper about these objective tests as 'one more fad', while the optimist would tend to disregard the disadvantages of the objective tests.

Broadly speaking, the values of examinations are two-fold: to assess how much factual material the pupil has acquired, and whether he has succeeded in assimilating those facts. Learning does no entail mere accumulation of factual evidence, it is as much important that these facts are properly comprehended and assimilated to form a coherent mass in the mind, success in this direction alone would enable the pupil to make proper use of the knowledge. It is not enough to know the meaning of the word abracadabra but the pupil should also be capable of applying it in the construction of a sentence. Similarly, one may learn all the facts related to the

Muslim Period in Indian history and yet fail to grasp the reasons for its downfall. The former aspect could very well be assessed with the aid of objective tests, but not the pupil's achievement in grasping the facts. Again, these tests do nothing to test the pupil's ability to express, whereas expression plays a very important part in learning. Clear expression of organized thinking is the only way for judging the extent of clarity in thinking. Failing in these respects the new type examination manifests its greatest drawback. These shortcomings in the objective tests have led many to look less favourably upon them, and they now re-investigate the possibilities of improving upon the existing essay type examinations.*

The doors for a compromise however are left open. If the new type examination fails to bring out into relief the pupil's ability to express his organized thought this could be partially achieved by requiring the examinee to sit for an additional examination in essay writing. Coupled with an essay or two the new type examination could do better than what could be achieved by either of the methods alone. This way we could enjoy all the benefits of the new type examinations without losing sight of other requirements. Usually the school student has to appear in examinations in about 10 papers every year. Barring mathematics all the other subjects are examined according to the essay type.† If there be one compulsory paper in essay writing carrying heavier marks than hitherto allowed its results could perhaps balance the marks obtained in the other subjects if the latter were examined on the basis of objective type.

However, it is not the technical aspect that is unsurmountable as is the practical aspect of the objective tests. For the time being there hardly appears any probability for this system to be introduced widely in this country for the simple reason that the costs prove rather prohibitive. To print the thosands of pages required in such an examination, or even the use of stenciled copies would be rather too costly for any institution to bear unless some centralized plans were evolved.

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* In a personal letter to the writer late Prof. C. W. Valentine, had expressed his considered opinion that in England "a backward swing in favour of examinations is beginning. I can say that impartially. because it was my own book "The Reliability of Examinations" published in 1923, which called widespread attention to the unreliability of examinations." (11.10.51).

† Strictly speaking even mathematics is not altogether free from the shortcomings of essay type examinations. The theorems in geometry and their corollaries, for instance, could be memorized and reproduced without understanding the steps or the underlying logic in the proof.

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[1] Op. cit., pp. 229-230.
[2] Mukerji, N.—An Inquiry About Examination, pp. 4-8.

CHAPTER XX

PSYCHOLOGY OF TEACHING METHODS

Man's supremacy over the animals remains unchallenged in the domain of expression. The unique transformations in the higher mental functions were brought about along with the usage of the symbolic expressions, and, reading and writing constitute the use of symbols. Language of man radically differs from the speech of animals in several respects. Firstly, the verbal expressions of animals lack in the distinctness, they form a sort of verbal gesture not unlike the grunting and groaning, sighing and laughing in man. Whereas, language as we understand it no matter how primitive it is depends for its quality on the articulated sound. Two words bearing the same spelling and pronunciation may convey separate ideas in their varying contexts. Each expression is a verbal transcription of a specific mental image, and these verbal pictures can be coherently linked together to give a consistent continuity. Secondly, man's language can be transcribed in several ways, for example, in writing, drawing, etc. This way, the progress in each generation has been successfully preserved for the benefit of the oncoming generations. Language thus forms the mainstay of what is described as social heritage.

Evolution of language is an absorbing subject by itself. The oldest inscriptions of the ancient Egyptians were mere pictographic reproductions of the objects; the word flower, for instance, was pictured by drawing a flower. This ingenious system of pictographic language devised about 5,000 years ago by the ancient Egyptians is known as heiroglyphics ("sacred writing"), this is believed to be the mother of all languages. Evolutional changes were later brought about in the written language by the early inhabitants of the land we now call Mesopotamia. This evolution has not stopped as yet since language is the expression of the living and with the changes in the life language is bound to change. The following illustration would show how a simple idea conceived forty centuries ago has given rise to the letter we use everyday.

Phoenicians used the symbol △ to stand for *door* and called it *dalteh;* the Greeks later used the symbol slightly changed to △ pronouncing it *delta,* the Romans changed it to *day, D,* which changed further to be known as D. Likewise, the Arabic numeral 2 which we use today can be traced to Sumerian symbolic expression for *two objects*— ٢ ; this symbol remains unchanged among those who make use of the Arabic script as in Urdu.

Since the first adoption of the symbols in writing and reading man has failed to devise any better method of expressing himself. If there has been any difference it is in the direction of the extensive usage of these symbols. By shortening these expressions, as in shorthand writing man has only proved that the tempo of his living has become too rapid even to write in long hand. However it would not be an exaggeration to state that our present day civilization stands or falls with the increase or decrease in the use of symbolic expressions. Here lies the importance of reading and writing.

Reading

While tracing the origin of alphabets and digits we saw that they represented something concrete. What is true for the individual letters is also true for the words and sentences —they represent disjointed ideas connected into systematic wholes. This means that the conception of the ideas must precede their expression. The child must be acquainted with the object mango before this word could be comprehensible to him. This mental preparation for assimilating an expression is known as *reading readiness.* It provides the young pupil with adequate background for what he was going to read. Tests are available to ascertain how much the new entrant to the school is capable of grasping what he would be expected to read. One simple test consists in showing the pupil a series of pictures depicting common objects and instructing him to point out a particular one asked for ; one card, for instance, may contain a number of pictures of fruits, another depicting animals, and so on. In the first he may be asked to point out the fruit named by the teacher, in the next, of a particular animal, etc. If however the child be already acquainted with the alphabets he may be shown a series of printed words starting with monosyllabic to the pollysyllabic words. According to the written instructions supplied along with, the pupil may be required either to read them or to point out these words which the teacher pronounced. Various such tests are now available. Evidently, reading readiness to a considerable extent would depend on the native interest in the child, his attention and such psychological factors. Pedagogically however, the child's proficiency in reading would depend on his adaptability in certain basic skills some of which are stated below.

(*i*) *Phonetic:* Since reading entails acquiring verbal expressions of the written symbols with the end in view of comprehending other's communications, correctness in the pronunciation is an important factor. A student of science may need to learn French in order to enable him to read scientific literature published in that language, and for this purpose he may feel no necessity for correctly pronouncing the words, but such cases do not represent the general need of learning a language. It is for social intercourse that we learn a language, to enable the listener to correctly interpret the ideas, so the respective words must be correctly pronounced. As knowledge in the construction of sentences is necessary for writing, elementary knowledge in phonetics is as much valuable for reading.

(*ii*) *Eye-movement:* Use of suitable devices can reveal that in reading the eyes do not move smoothly, they tend to move in jerks. At the earliest stage the eye fixation shifts from letter to letter in a word, next, from one word to another as these grow familiar to the reader; and then from one group of words to another. The vision is focused at a spot, a number of words are read together and the eyes then turn to the next group of words staying there for a fraction of a second, and thus proceeds reading. The number of words recognised at a time is known as *recognition span*. As it may be imagined, this span increases as the efficiency is gained in reading. Psychologically, efficiency in reading increases with the enlarging of the recognition span. Temporal aspect of the recognition span is called *rate of recognition ; i.e.*, the time taken to recognize a group of words at a time. Reduction in the rate of recognition facilitates the fluency of reading.

(*iii*) While a pupil is engaged in reading a certain passage if the page were suddenly covered and the reading material were cut off from his visual field he would continue to read some of the words which he had not made any effort to see. This simple observation would prove that the visual perception of the words and their vocal reproduction do not proceed at the same rate, the latter as it were trailed behind the former. The number of letter-spaces between the words seen and the words uttered is known as the *eye-voice span*. In the young child who has just started reading sentences the eye-voice span is zero because he isolates each word and pronounces it separately from the rest. This causes the jerkiness in the young reader. Gradually he develops the habit of looking at a group of words simultaneously and reproducing the words. The subsequent increase in the eye-voice span is a healthy sign in reading maturity. Even after the development in the fluency of reading the eye-voice span may be reduced to zero if in reading an unacquainted word meets the eyes. The reader then would stop to recognize the word. At this juncture the recognition span too would contract rather suddenly.

(*iv*) The next basic skill in reading at the elementary stage constitutes the *rhythmical progression* of the eye movements. Though the eyes move in a jerky manner there can be discerned a definite rhythmic pattern in their shifting from one group to another group of words, and this can be demonstrated with photographic devices. This rhythm is introduced with the growing efficiency in reading. Prior to reaching this stage the eyes not only hop arhythmically but, also, backwards at times. In reading a sentence for instance· the pupil may read correctly the first four words and then, instead of moving forward to the fifth word, he may come back to the third word, though he may not actually pronounce it. After halting there momentarily his vision would shift next in search of the fifth word but may land at the sixth or the seventh word. This defect is usually ascribed to the undeveloped condition in the oculo-motor control. It needs no stressing the fact that insufficiently developed rhythmical progression retards fluency in reading.

What have been mentioned in the above refers to the psycho-physical skills in reading. The psychological aspects in the reading ability however could not be underrated. The foremost among the latter is *interest*.

The first step in this direction is the achievement in the spelling of words and pronouncing them correctly. Next, when the pupil apprehends the meaning of the word his interest is further enhanced. As he develops the ability to read the sentence all by himself he feels the glow of pleasure which may be compared to the first ride on the bicycle unaided. With the growing fluency the next point of interest is the reader's capacity to grasp the content. The reader's attention at this stage should not be allowed to divert to any difficult word that he may stumble upon. If he may grasp the sense of the passage even without understanding the meaning of this word he should be encouraged to gloss over it; if however this one happened to be a key word the child would be interested, and benefited, to know its meaning.

Perceptual growth is another determining factor in reading. As we have seen in our studies in the development of perception, the object is fully perceived when there appears in it a meaning. The name of the object helps in conveying its meaning in the absence of the object. Once perception of that object has developed, the meaning is acquired and it becomes easier for the teacher to link the written word as a symbol for the meaning previously acquired. The word as a whole has similar values as the picture of the object. The set of words used in writing TABLE will be pictured differently from BANANA, though the word FABLE may at times create confusion with the word TABLE. Anyway it is the word as a whole that the child pictures in reading and so arises the necessity for discarding the antequated method of teaching the letters first and the words afterwards.

With the development of object sense there grows the relation sense. And this is the time for beginning sentences. The sentence relates an event, links the constituent parts of the event, i.e., it depicts the relationship between more than one object or idea. Attempts should be made to teach sentences after the child can utter the words.

As regards the growth of vocabulary it may be mentioned that it does not maintain the same rate all through the child's learning. Vocabulary is the largest during the earlier stages and the rate of growth decreases with the child's advancing in age.

Writing

Writing is the counterpart of reading, one could not evolve without the other. The basic skill in handwriting is provided by coordination of the fingers, wrist, and the arm. Knowledge in the respective functions of these is important for the teacher in view of the fact that each of these has a specific bearing at the different age levels.

Development of the muscles requisite for writing begins to take place with the sixth year and is completed for all practical purposes by the twelfth year. The teacher should take cognizance of the fact, which is in accordance with the biological principles, that coordination of the larger muscles appears earlier than that of the finer ones. To start with, the child finds himself incapable of holding pen so he grasps it, which incidentally reminds us of the innate grasping reflex in the child. By training him to hold the pen, as we understand by the expression, emphasis is shifted from the coordinated activity of the larger muscles to the relatively smaller ones. It is presumed that the child by now has gained enough control in the former, nevertheless the teacher should keep a watch over the respective uses of the both as also of the finger and the wrist movements. The finger joints, the wrist and the elbow joint along with their muscles and tendons function in writing as a coordinated set of levers one depending on the rest.

It may now be understood as to why the children at the initial stage are advised to practise with large and stout pens rather than with small or fine ones. In many places in India the child is initiated in writing letters on sand with bare fingers. This is a justifiable method for training the finger muscles and joints ; at the same time the sharp tactual stimuli facilitate in the perception of the letters. The same principle is involved in tracing sand-papered letters as advocated by the adherents of the Montessori method. The practice of using reed pens too has its values. With the novel experience of handling a pen the child tends to grip it too firmly and press it hard against the writing surface. This attitude reduces the flexibility so essential in writing fluently, increases the muscular tension and causes a rapid onset of fatigue. By using finely mended reed pen the writer is compelled to hold it lightly. From this point of view it would be more scientific to start with the brush and paint. To draw a fine line with the aid of brush it requires delicate handling, and once this habit is formed undue pressure would not be exerted over the pen. In the absence of facilities for using paint and brush it would be advisable to let the child use reed pens finely mended.

Attention should next be given to the wrist movements. The tendency in the child is to use the elbow joint for support and employ the whole arm in writing. More desirable it would be to use the wrist as the pivot over which the fingers could freely rotate. One query frequently raised is, which of the three methods in writing is most desirable: tracing, copy book writing, or writing from memory? Practice of tracing should be forthwith rejected. In tracing the child is taught to perform an act which offers little scope for training in self reliance. Tracing is as much of habit formation as is writing from copy book models or from memory but the former is unproductive when compared with the latter two in which the child gains independence. After the child has practised in tracing, which he may do in a mechanical manner, when he attempts to write independently he is faced with more or less a problem with which he had originally started, very little transfer of training takes place from the tracing habit to the writing habit and so the process is uneconomical. To start with, copying a model would be more judicious, but he should be encouraged to write independently from memory at the earliest opportunity. This way his style would not be cramped. The æsthetics in handwriting, which appears to be fast losing its strong points, could be developed by comparing with better specimens of transcription. Regarding the comparative merits in manuscript writing, i.e., transcribing printed letters, and writing in the cursive style at the initial stage opinion remains divided. Manuscript writing should however be discouraged as soon as the child feels capable of recognizing the letters. Speed in writing should be considered only after a minimum of efficiency has grown in the quality of the child's handwriting.

Arithmetic

Achievements in civilization are the direct outcome of the needs and necessities of the man. One of the greatest achievements was the birth of the numbers. Conception of number arose with the necessity for keeping a check upon one's property. There are many tribal people today who have no expression to depict more than four or five digits, they never felt any need to know. The washermen usually count by 20's, maybe he finds few customers giving more than twenty garments at a time, With the need enlarging conception of number gradually widens; million as a unit came to be used so frequently only during the last wars with reference to the expanding budget and the army. And, the mental growth of the child very much resembles the evolution of the mental aspects of man as he arose from the lower stages. The child at its third or the fourth year is too busy in studying qualitative aspects of the objects he encounters; only when this desire is partly satiated he turns towards the quantitative reckoning. In this respect its conception starts with only two numbers—one and more than one, the latter is referred to as 'more' and this sense arises soon after the completion of the second year. Once this sense has taken its root he starts dividing the 'more' into subclasses. He is aided by the number words spoken by the elders—two spoons, four legs of the table, five fingers, etc., and he tries to distinguish between these words. With the meaning emerging out of these new words his conception of number begins to grow in complexity. By the sixth year most children can count up to ten. But at this stage he possesses no abstract idea about ten. All numbers he comprehends on the bases of the actual objects he may have handled. Even in the case of many adults who did not have any formal training it is almost impossible to conceive 1,000. We now see how the abacus, the counting frame, has served useful purpose in this respect. In some countries like China even today the abacus plays an important role in the transaction of petty trades.

It is not possible to operate numbers below the sixth year of mental age. Until the child has reached this stage of maturity it would be advisable to train him in the numbers with the aid of concrete objects like marbles or tamarind seeds since concept arises out of percepts. Even after he has attained the requisite mental growth there remain two other skills in which he must develop before any formal training in arithmetic could be considered. These are the understanding of the significance of numerical relationship and language facility for handling numbers. The child who can count five objects placed before him may not be able to answer the question: how many are these? His confusion would be caused by the dual conception of 'five' and 'fifth'. More difficult would be the question: how much is 3 and 2 when *added*. The expression like 'much', 'less', or 'subtraction' depicts the number relation. These cause similar difficulties in the child's comprehension as the conception of -10 and $+3$ to a pupil of class V, or $\sqrt{-1}$ to a student of higher class. Next in importance is the ability to freely handle the words which compress large or complex number patterns into small expressions. Five thousand three hundred and seventyeight is the compressed expression of magnitude which few could realize without formal training. So could be said of the expressions like square and fraction when these come to be used later.

Like the perception of objects preceding conception of sentences, the basic skills in arithmetical computation can grow only after a thorough mastery of the numbers. Judged from this point of view forcing the child to memorize multiplication table at an immature stage is of little use ; thereby he would mechanically chant some mystery words so to say.

Experience we find once more coming to the aid of the learner. The child of a shopkeeper sitting by his father's cash box enjoys better opportunities for developing the number sense, and later in counting than the children of more sophisticated families having less access to such easily computable objects.

The method in teaching too has now varied. In the schools of older models the basic skills in the four principles were taught as separate arithmetical functions. Whereas, a modern teacher would reduce the principles into only two. Multiplication is a shorter form of addition, and division a concise form of subtraction.

Foreign Language

Owing to the peculiar condition in which India has been placed it appears that English may have to be retained for some time longer as one of the principal subjects for teaching in schools and colleges. As a foreign language it may not find a place in the curriculum for the elementay schools but its being considered here owes to the fact that it presents unique problems in teaching.

Language of a nation is the reflection of the life of the people. It is not only through the content but also through the form of the language that we can have any access to the cultural level attained by the people. It is for this reason that one encounters difficulties in translating a foreign language. It is for the same reason that we often fail to appreciate a foreign language, and for the same reason too that we feel the difficulty of obtaining a correct picture of unacquainted foreign people through their medium of expression. Not only that, the language itself becomes difficult to master when we attempt to translate it literally. When an Indian pupil translates "the man" in an Indian language what he actually says when retranslated into English would mean "that man". Most of the vegetation and animal life in a country, festivals and rituals, manners and customs as also the terminologies in science and arts defy attempts to translate without changing the idea. Only a few years back it was not possible to translate the word atom bomb, today we have only its translation, the jet plane has not found any translation, neither the word academy. To understand and appreciate a foreign language it is essential to know something about the mode of living and the cultural pattern of the people. This is the reason why a language could be learned comparatively with ease and with precision if one had an opportunity to live among the people habitually speaking that language. It is now increasingly felt that the old method of learning a foreign language by acquiring a few vocabularies and memorising the rules in grammar and syntax is something too artificial to be maintained. Yet this is the principle unhappily adopted in learning a foreign language.

There are two basic principles in teaching a foreign language though they differ in applicability but not much in the fundaments. The main idea behind the teaching of a language is to help the learner in gaining proficiency in reading, writing, speaking and understanding it, and the more these functions are stimulated the more profitable would be the results.

According to the *organic theory* it is preferred that the foreign language should be taught through life-like situations and amidst the diverse modes of creative activity, like drama and puppet show, exhibition of films, and other cultural media. Such programmes would enable the pupil to acquire realistic experience of the cultural pattern blending into that particular language.

The *extensive reading theory* is comparatively easier to put into practice. If the environmental atmosphere implied in the organic theory be not possible to reproduce the pupil may be given an extensive account of the life conditions in which that particular language has taken its root. This could be achieved with the aid of narration of history and geography of the land where the language was primarily spoken, ballads and fairy stories, by pictorially demonstrating the prevalent customs and manners and the various functioning of the social institutions. This way a fair amount of consistent idea of that place could be formed in the mind of the pupil enabling him to grasp the new phrases and expressions in their correct context.

CHAPTER XXI

STATISTICS IN EDUCATION

WHAT IS STATISTICS?

The teacher is often required to give his opinion regarding the abilities or performance of individual students, to judge their merit and deficiency, or compare one class with another. Likewise, the inspecting authorities are called upon to make comparative evaluation of the different schools. The directorate of public instructions faces similar problems though of wider magnitude. In these varied tasks each concerned is expected to give his individual opinion and yet *his* is accepted as the yardstick and decisions are taken on the bases of the personal views. While reviewing the problems of examination it was observed that the personal assessment after all is not a reliable indicator. Nevertheless, such estimations are unavoidable—even are essential requirements in the everyday functions of the teacher. He is aware of the fact that qualitative evaluation is not enough, to say that the pupil is backward does not take one far, the nature of the backwardness has to be quantitatively reckoned. However, the qualitative assignment and quantitative assessment are closely related. For example, to call A as the best pupil in a class of 26 and Z the last boy may be qualitative assignment, any further attempt to rank all the pupils according to their merits would entail quantitative evaluation.

Quantitative estimation is an unavoidable necessity and the requirements are diverse. In drawing the norms of physical growth, mental development and educational achievement we have to refer constantly to the group. Abilities of an individual are compared with the attainment of the group to which he belonged and his position determined. Here lies the peculiarity of the numerical science constantly employed by the educationists, psychologists and biologists. They are aware of the fact that no two boys, for instance, would show the same rate of growth in mind or body, yet there exists a similarity in the *trend* of the development. When we say that children possess a vocabulary of 270 words on the completion of their second year, it is presumed that this value was arrived at after observing a considerable number of cases though an individual here and there may have failed to comply with the norm. The science which has evolved in the course of the studies of groups and patterns is known as *statistics.*

Such comparative studies also assist the teacher in his critical estimation of the methods and results of his teaching, the progress that he has made, and in assigning grades, etc. By applying proper techniques in statistics such tasks not only become less arduous but, also, the results are made more reliable. Some of the elementary principles in statistics will now be discussed and it would be then realized how these could be helpful to the teacher in his routine duties.

FREQUENCY DISTRIBUTION

Data* collected in the experiments or after applying tests bear little significance until they have been properly sorted out and classified. If the number of the data (denoted by the symbol N) were limited a cursory glance might reveal the significant features, but this would not be possible if the data were large. In handling factual evidences, therefore, the first task that confronts the student of education is the organization of the materials so that the figures could tell their own story. How this could be done? To start with, by grouping the measures and determining their patterns of distribution into certain classes or categories. If the pupils in a grade were classified into Good, Average, and Poor, it would be a rough method of adopting the principle of frequency distribution. The following technique would, however, offer a more refined process. Let us consider the marks obtained by pupils in the two sections A and B in the same class:

	Marks of the pupils
Section A	38, 17, 6, 29, 14, 20, 16, 22, 10, 41, 15, 12, 21 8 31 42 19 33, 26, 16, 21, 20, 13, 11, 9.
Section B	11, 13, 7, 21, 19, 12, 6, 25, 16, 32, 7, 6, 15 7 22 18 17 9 21 31, 19, 8, 12, 16, 23.

TABLE 6.

The simplest method of determining the mode of distribution of these marks would consist in:

(i) *finding out the range of the marks.* Now, the range of a gun tells us the distance within which the fire-arm could operate, the range of the marks or scores gives us an idea about the extent of diversity in the group within the two extremes. The range is determined by subtracting the minimum from the maximum and adding 1 to the remainder. If 1 were not added to the remainder the minimum mark would be excluded. In subtracting 5 from 10 on the fingers for example, we count from 6 and following this principle the range would be short of one score, that is why 1 is added. The range in the Section A (Table 6), therefore, would be $(42-6)+1=37$, and in the Section B it would be $(32-6)+1=27$.

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* It is the plural of *datum* which means factual evidence, which may be narrated verbally or numerically.

(ii) *deciding upon the number of classes in which the distribution was to be grouped.* The teacher may use only three classes—Good, Average, Poor, but he has the choice of using five classes or even more. Any decision regarding the number of classes to be made is therefore to be arbitrary, depending on the requirement and convenience. The number of classes if were made too small it would fail to bring out the features intended to be focused, on the other extreme, too many groups would make it unwieldy to handle the classes. To avoid the vagueness in the classes Good, Average and Poor, it may be decided to include in the former all those pupils whose marks varied between, say, 98 and 66, $0-32$ in the latter and call those pupils Average whose marks fell between 33 and 65. The marks would then be said to be divided into three *classes* or *intervals,* with the size of the interval being 33 points. The *number* of intervals naturally would depend upon the *size* of each interval. Considering the case of the pupils in the above table, if the range in the Section A were divided into 6 groups each would contain the marks of 6 pupils. If on the other hand it were decided to have 5 marks in each group, there would result in eight classes or intervals, viz., 6-10, 11-15, 16-20, 21-25, 26-30, 31-35, 36-40, 41-45. The latter would suit our purpose.*

For a quick perusal of the data it is preferable that they were arranged in a tabular form. In the first column should be lodged the magnitude of the intervals, in the adjacent column the individual data should be tallied in bundles of five, and the last column should contain the total frequency (f) in each class. The data contained in Table 6 have thus been converted into the Table 7.

---

* It has become conventional to use not less than 10 and not more than 20 classes for determining the frequency distribution.

Section A

Class Interval	Tally	f
41—45	||	2
36—40	|	1
31—35	||	2
26—30	||	2
21—25	|||	3
16—20	𝍸 |	6
11—15	𝍸	5
6—10	||||	4

N = 25

Section B

Class Interval	Tally	f
41—45		0
36—40	||	0
31—35	|	2
26—30	𝍸	1
21—25	𝍸	5
16—20	𝍸	5
11—15	𝍸 ||	5
6—10		7

N = 25

TABLE 7.

Difference between the Tables 6 and 7 may now be made clear. Whereas the marks in the Table 6 formed meaningless jumbles those in the Table 7 bring out in relief some of the characteristics in the clusters of the figures. More pupils in the Section A, for instance, have achieved high marks compared with the Section B, again, in the latter more pupils are grouped at the lower end of the scale. If the classification in each Section were horizontally divided into four equal quarters it would be found that three more pupils have found place in the bottom quarter in the Section B than in the other Section. Again, three pupils in the Section A though would have been lodged in the top quarter there would be none in that quarter in the Section B. Such facts would justify the conclusion that the standard of the pupils in the Section A is unambiguously superior to that in the other Section. To sum up, determining the frequency distribution is a useful technique in clarifying the characteristic features in a group particularly when it contained a large number of data, and also in making comparative studies.

GRAPHIC REPRESENTATION OF FREQUENCY DISTRIBUTION

Though the frequency table is helpful in the analysis of the inherent characteristics of the data, a much better picture may be obtained in transforming these into a graphic form. A picture always tells a story more impressively than it could be told in words. The steps involved in constructing a frequency graph may be summarized as in the following:

(*i*) Draw on a graph paper two straight lines perpendicular to each other (OX and OY in the Figure 27) which may be called the X-axis and the Y-axis respectively.

(*ii*) Lay off the class-intervals of the frequency distribution along the X-axis. It is customary to begin with the lower limit of the interval *next below* the lowest in the actual distribution and end with the upper limit of the interval *next above* the highest in the distribution. If the marks in the Section A were to be graphically represented the lowest limit on the graph paper would start at the interval 1-5, the next one would be 6-10, and so on, ending with the highest limit 46-50. In laying off these intervals on the X-axis the lowest one is marked nearest the point of intersection at O.

(*iii*) Mark off the Y-axis with successive units to represent the frequencies in each class interval. The units should be such that the maximum frequency could be easily accommodated. It would be, therefore, convenient to find out the maximum frequency, as shown in the last column of the frequency table, and divide the line OY into such units which could represent this (f), then the rest of the f's could be represented on this scale.

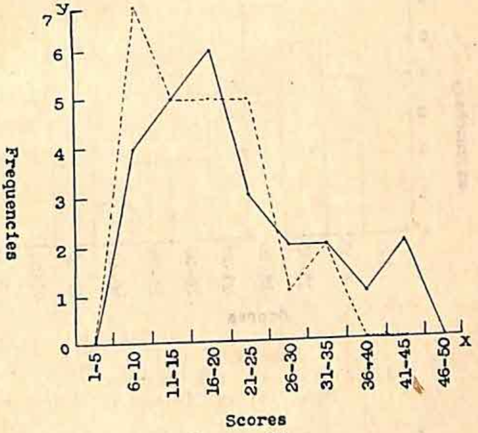

FIGURE 27

FREQUENCY POLYGONS OF THE SCORES IN TABLE 8. SECTION A IS REPRESENTED BY CONTINUOUS LINE AND SECTION B BY THE DOTTED LINE.

(*iv*) At the mid-point of each interval on the X-axis go up in the Y direction—a distance equal to the number of scores on this interval. At the interval 6-10 for instance go up to four units, at the interval 16-20 to six units, and so on. These located points should be marked.

(*v*) Join the points with straight lines to give the frequency its graphical form. This zig-zag outline is called the *frequency polygon.*

It may be added here that the frequency polygon indicates the distribution pattern as a whole, the individual scores here lose their identity. However, another advantage of the frequency graph results from the fact that more than one distribution could be represented on the same graph making it convenient to compare the distributions.

Frequency polygon however is only one of the various forms of diagrammatic representations. A more solid form could be obtained by slightly altering the technique mentioned above. In a frequency polygon all the scores in the given step-interval are represented by the mid-point of the interval ; that is why this mid-point is raised to the required height to represent the number of the data in that interval. Instead, the whole line covering the class-interval could be raised to the desired height on the Y-axis. What will then ensue would not be a zig-zag polygon but a series of steps of equal base with unequal height. Area of each rectangle will be proportionate to the frequency at that interval. This figure, as shown in the Fig. 27(a), is known as *histogram*, *bar diagram*, or *column diagram*. In a comparative study more than one histogram could be raised on the same graph provided the other requirements were fulfilled. Fig. 27(a) represents the histogram of the marks in the Sec. A, Table 7.

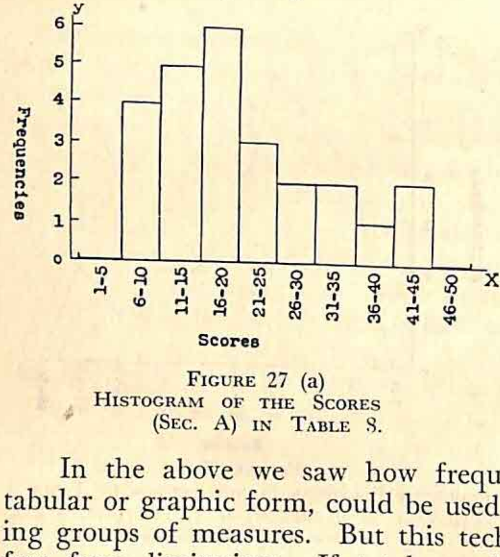

FIGURE 27 (a)
HISTOGRAM OF THE SCORES
(SEC. A) IN TABLE 8.

In the above we saw how frequency distribution, in a tabular or graphic form, could be used as a device for comparing groups of measures. But this technique is not altogether free from limitations. If total number of the data in the groups were not similar it would not be possible to adjudge the data merely on the basis of the frequency distribution. Suppose the Section A contained 20 students and the Section B 30 students, the same f in one class-interval would not bear the same significance then. Obviously some other method would then have to be devised. One of the simplest procedures that could be effectively used lies in determining one or other *Measure of Central Tendency*.

MEASURES OF CENTRAL TENDENCY

All the inhabitants in a country, say, in India or Japan, are not exactly similar in their manners, customs or behaviour, nevertheless, *an* Indian could easily be distinguished from *a*

Japanese in more than one respect. Here this Indian or Japanese acts as the representative of his people. A figure likewise could function as an individual to represent a group though in itself it might not be an actual member of the group. The data in the Table 8 are the marks obtained in Arithmetic by 21 students in Class VII and 30 students in Class VI. Which of the two classes, it may be questioned, has achieved better result? This problem could be solved if we could pick out two students representing each of the two classes, or better, if we could determine marks typifying each class. This can be done in either of the three ways, by determining (*i*) the *mean* of the marks obtained in each of the two classes, (*ii*) the *median*, or (*iii*) the *mode*. The necessary steps are given below.

Class VII	40, 6, 37, 9, 34, 14, 32, 15, 31, 16, 30, 18, 30 20 18 29 23 28 23, 24, 23.
Class VI	9, 10, 11, 30, 30, 31, 12, 12, 14, 29, 29, 28, 28 15 19 16 16 26, 24, 26, 20, 23, 21, 21, 23, 20, 20, 20, 11, 21.

TABLE 8.

(*i*) *Mean*: More precisely it is known as the *Arithmetic Mean* or the *Average*, and is represented by the symbol M or Av. It could be defined as the sum of the separate scores or measures in a series and divided by the number of the measures accounted for. If a man earned Rs. 3/-, 4/-, 3/8, 5/- and 4/8 on five successive days, his mean daily wage Rs. 4/- is obtained by dividing the sum of his daily earnings by the number of days he had worked. The formula for the Arithmetic Mean of an ungrouped series of data is

$$M = \frac{\Sigma X}{N}$$ where N is the number of scores,
X is the value of each individual score,
and, Σ (upper case sigma, a Greek letter) stands for "sum of".

Applying the above principle, mean of the marks in Class VII and Class VI would be 25.0 and 20.5 respectively. In other words, the marks awarded to the students in the Class VII are 'on the average' 25. Or, it may be said that the 'average' student in that class received 25 marks, though it would not be possible to describe precisely what an average student was like. Similarly, in the class VI the average mark of the pupils is 20.5 though no student had actually obtained that mark.

The mean may then be conceived as a representative value of a group, round which the data tended to cluster. It is for this reason that it is known as a Measure of Central Tendency.

The above formula, however, would not be applicable to the data if these were grouped, and, it would be cumbersome to handle any large number of data unless they were arranged in classes. To determine the Mean of the measures arranged according to the class-intervals the following formula would have to be applied.

$M = \frac{\Sigma fX}{N}$ where X is the mid-point of a class interval,
f the number of cases within an interval,
and, Σ and N bear the same meaning as before.

The above formula may be applied to determine the mean of the scores in the Table 7. For convenience in computation the process may be tabulated as in the Table 9.

		Section A		Section B	
Interval	Mid-point	f	fX	f	fX
41—45	43	2	86	0	0
36—40	38	1	38	0	0
31—35	33	2	66	2	66
26—30	28	2	56	1	28
21—25	23	3	69	5	115
16—20	18	6	108	5	90
11—15	13	5	65	5	65
6—10	8	4	32	7	56
		Total 520		Total 420	

M_a (Mean of the Section A) $= \frac{520}{25} = 20.8$

$M_b = \frac{420}{25} = 16.8$

TABLE 9.

(*ii*) *The Median* (*Mdn*): When ungrouped scores are arranged in order of size, the median is the mid-score in the series. If the marks of the Class VII (Table 8) were arranged in ascending order from the bottom (it is customary in educational statistics to place the lowest figure at the bottom of the table and the highes figure at the top) as shown in the Table 10a, the mid-point could be located at 23, and this would be the median.

If, however, the marks of Class VI were likewise arranged (Table 10b) a difficulty would arise since the N here is an even number. To overcome this obstacle the mid-point of the mid-most scores can be taken as the median. In this case the two middlemost scores are 20 and 21, so the median would lie at 20.5.

40
37
34
32
31
30
30
29
28
24
→ 23
23
23
20
18
18
16
15
14
9
6

Table 10a

31
30
30
29
29
28
28
26
26
24
23
23
21
21
21
→ 20.5
20
20
20
20
19
16
16
15
14
12
12
11
11
10
9

Table 10b

In case the number of the data were large it would cause inconvenience in determining the median by counting. In such case the following formula may be applied:

Mdn = the $\frac{(N+1)}{2}$ th. score in order of size. In the first case it will be $(21+1)2$ th. score, i.e., the 11th. score from the bottom or the top; in the second case the median will be the $(30+1)/2$ th. or the 15.5th. score, i.e., the score half-way between the 15th and 16th. score.

(*iii*) *Mode*: In a simple ungrouped series the mode is that measure or score which occurs most frequently. In the series contained in the Table 10a the mode is 23, while in the next series it is 20.

In answer to the question: out of three methods described in the above which is the most suitable, it may be said that each of the methods has its own merit. For greater precision and reliability of course the mean should be used. If however there be paucity of time, if the rough measure is all that is wanted, or if the N be small, the median or the mode may well serve the purpose..

The values obtained from the statistical treatment of data may at times prove irksome. The results need be interpreted cautiously since the technique may be faultless and yet the result may fail to bear real significance. Now, a measure of the central tendency is derived with end in view of obtaining a single figure which could represent a particular group. Consequently, a good deal of caution has to be observed in seeing that it truly represented the group, and that it did not turn out to be a spurious representative. A mean would be valid only when the measures in the series really tended to cluster round it. If the scores were scattered too widely from the mean the latter despite the correctness in computation could hardly be regarded as a representative of the group.* In order to check up the reliability of the measure of central tendency obtained some other techniques have to be adopted. These are called the *measures of variability*. Before proceeding to study how these variations could be measured it would be, however, worth while to know something about the nature of the individual variations in a group, that is, how the measures usually tended to be distributed in a cluster.

THE NORMAL DISTRIBUTION

When a teacher refers to a class as 'average' what he means is that there are few boys who could be classed as very bright or very dull; intellectually, most of the pupils stood close to one another and to the 'average merited' pupil. Likewise, to refer the class as a whole 'poor' or 'bright' it would not be denying the presence of the 'average merited' boys in that class, only that the latter may be rather fewer than expected and the presence of a 'very bright' may here be expected still less. The teachers are aware of the common fact that their classes usually constitute of few extreme types of pupils, the majority bearing different shades of intellect varying between the two extremes. But it would be rather difficult for him to explain why should he expect this sort of pupil distribution.

Considering an example in another sphere where statistical methods could be employed, if a large piece of land were divided into 500 equal segments and sown with the same quality of seeds, despite all conditions remaining same, each plot would not yield exactly the same quantity of grains. Neither would they show any remarkable divergence in the respective yields. If the average of the produce of the separate plots were drawn it would be found that most of the plots produced quantities of grains very near the average and some might produce comparatively much more or much less but such instances of extreme divergence would be fewer as we move from the average towards the two extremes. Marks in the examination show similar patterns of distribution. In the matriculation examinations, for instance, the candidates are presumed to possess similar intellectual and educational level. And this assumption is proved by the fact that the marks of most of them lie nearabout the mean of the group. But it would not be unnatural to come across a few students getting 10% of the total marks and a few standing near the top of the range. If however we came across any startling case where most of the candidates in a class fell in either of the extreme categories we may surely expect something wrong in the examination, and such a case would be regarded as beyond the normal expectations.

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* A millowner could not be regarded as a representative of the labourers by virtue of his working in the same factory. He might manage to secure the votes of the workers and come to be recognized as their representative in the Assembly but he could hardly be considered as their true representative.

Briefly, it appears to be a 'law of nature' that accidental events, those which were not purposely influenced, tend to happen according to a definite pattern ; those which may be labelled as average occur more frequently and those which deviated from the average very widely occurred less and less frequently.

But what is a normal distribution? To explain it we shall take help of a simple experiment. Suppose ten coins were tossed together a large number of times, some would eventually fall on their heads and some on their tails. The coins in any particular toss may fall according to one or other of the patterns of heads shown below:

H^0, H^1, H^2, H^3, H^4, H^5, H^6, H^7, H^8, H^9, H^{10}.

Evidently there could not be any other possibility. If instead of the heads the number of tails were considered the results would not be different.

But in what proportion would these be expected to fall? Could we expect any trend or pattern in the frequency of heads appearing when the coins were tossed? Well, if the performance were repeated half a dozen times nothing peculiar might be revealed, the results then could be truly described as the outcome of 'chance' as we understand by the expression. But this very chance would appear to have its own laws if the ten coins were tossed in the same manner for a very large number of times. The results of such an experiment conducted by the writer are recorded in Table 11. This table represents the respective frequencies of all the possible combinations of heads and tails which appeared when 10 coins were

Number of heads	*Obtained frequency*	*Theoretical frequency*
H^0	4	1
H^1	16	10
H^2	53	45
H^3	107	120
H^4	223	210
H^5	237	252
H^6	202	210
H^7	133	120
H^8	40	45
H^9	6	10
H^{10}	3	1
Total	1024	1024

TABLE 11. Results of tossing 10 coins at a time for 1024 times.

tossed for 1024 times. In the extreme right column have been laid down the theoretical frequencies, forecasts made with the aid of mathematical principles. That the difference between the theoretical expectations and the actual events is not much it is evident from the results graphically represented in the Fig. 28. On the Y-axis is depicted the frequency of the heads appearing, and on the X-axis are laid the possible combinations of heads. The characteristic features in such a curve are that: (*i*) a very large number of the data are heaped around the central region of the scale of the measures, (*ii*) proceeding towards the ends of the scale the respective frequencies of the events grow smaller, and (*iii*) the variations of the data from the mean in

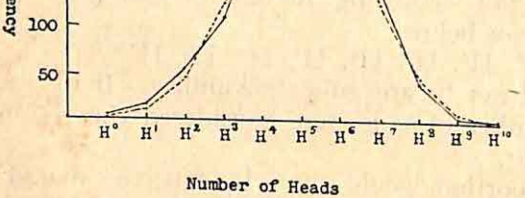

FIGURE 28

COMPARISON OF THE FREQUENCY POLYGONS CONSTRUCTED WITH THE DATA ACTUALLY OBTAINED BY TOSSING 10 COINS FOR 1024 TIMES (CONTINUOUS LINE) AND THE FREQUENCIES THEORETICALLY OBTAINED (BROKE LINE).

the two directions tend to be proportionate and symmetrical.

Interestingly enough these features are evinced in the distribution of all kinds of measures of accidental events provided no attempt were made to select them. With the aid of varied observations Gauss, a famed mathematician, had concluded that modes of distribution of the events and their frequency could be precisely determined by a formula. Using the formula the curve could be made perfectly symmetrical. This ideal curve has been termed *Gaussian Curve* or the *Curve of Chance*. In the Fig. 29 the bell-shaped curve is the ideal curve of chance as determined by Gauss. With the aid of this kind of curve the probable proportion of events in any particular interval could also be predicted. Tossing ten coins for only once it could not be said how many heads would appear but it could be conjectured, and correctly to an extent, how many times five heads may fall if 100 times the coins were tossed simultaneously; evidently, the larger is the number of tosses the greater are the chances of correct prediction. It could not be said for certain which persons in a particular country would die in that year or in which houses the proverbial stork may visit, but the probable number of deaths and births can be guessed. For this reason the ideal curve has also been called *Probability Curve* or the *Normal Curve of Distribution*.

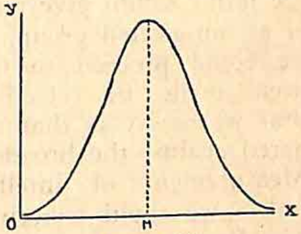

FIGURE 29
THE IDEAL NORMAL PROBABILITY CURVE.

In practice no distribution of events follows the ideal curve in exactitude, nevertheless, it has been observed to follow this pattern as we can see for ourselves from the distribution of the heads in the experiment cited above. It is however a fact that the larger the number of events closer would be the resemblance of the curve obtained with the ideal curve. The obtained curve if were smoothed using proper technique would also approach the typical Gaussian curve.

It may now be asked how the students of education would be benefited from this knowledge? The mode of distribution as represented in the Normal Curve is applicable to all psychological and physical measurements provided the requisite conditions were fulfilled. Results of intelligence tests or achievement in the school examinations of a large number of pupils would follow similar pattern. Measuring the I.Q. of 1,000 unselected children, for instance, Terman found them distributed in the following manner.[1]

I.Q.	56-65	66-75	76-85	86-95	96-105	106-115	116-125	126-135	135-145
Per cent of cases ..	0.33	2.3	8.6	20.1	33.9	23.1	9.0	2.3	0.55

Once we have a clear conception of the mode of distribution of a particular trait in the mass it becomes easier to compare a smaller group of samples. The distribution of the trait in the latter would give an indication whether it was a selected or an unselected group, if it belonged to the former category we could proceed to find as to where the emphasis had been made in selecting the group. Another advantage that we derive is that an individual's datum could be compared against the broader group, and its position determined. Measurement of intelligence would not mean anything unless we could conceive the values of 100, 40 or 140 I.Q. The Probability Curve helps us in this direction. This deviation of an individual measure from the mean of the group though could be well pictured in a graphical representation of the data it is admittedly a laborious procedure to prepare. Simpler methods can be employed by using one of the following techniques.

MEASURES OF VARIABILITY

If the measures of central tendency represented the unity in diversity, the measures of variability reflected the extent of diversity in the represented unity. The magnitude of variability could be determined by the:

(1) *Range:* This is the simplest method of determining the dispersion of the measures contained in a group. Referring back to the scores in the Table 6 we find that the marks varied between 6 and 42, and 6 to 32 in the two sections respectively. The range of variation in the two cases would then be 37 and 27 respectively. There is therefore greater compactness in the latter than in the former group. The representative score in the latter could be taken as a comparatively better index of the group than in the former.

(2) *Standard Deviation or S. D.* (represented by the symbol σ, lower case *sigma*, a Greek letter) is a better indicator of the

variablilty of the data. The steps to determine it are summarized below:

Step 1. Find the mean of the data. (M)

Step 2. Find the deviation of each datum from the mean. $(X-M)=x$.*

The x in the S. D. is always determined from the mean.

Step 3. Square each deviation separately. (x^2)

Step 4. Add the square deviations. (Σx^2)

Step 5. Divide the sum of the squared deviations by the number of the data. $\left(\frac{\Sigma x^2}{N}\right)$

Step 6. Find the square root of the remainder obtained in the Step 5.

The formula for the S. D. then would be:

$$\sigma = \sqrt{\frac{\Sigma x^2}{N}}$$

This technique may now be applied to determine the S. D. of the following two series of scores (a) and (b) in the tables 12(a) and 12(b)

SERIES (*a*)

Scores	x	x^2
18	6	36
16	4	16
14	2	4
13	1	1
12	0	0
12	0	0
11	1	1
10	2	4
8	4	16
6	6	36
120		114
12		

Table 12 (*a*)

$$\sigma = \sqrt{\frac{114}{10}}$$
$$= 3.3$$

SERIES (*b*)

	Scores	x	x^2
	32	20	400
	30	18	324
	18	6	36
	10	2	4
	6	6	36
	6	6	36
	5	7	49
	5	7	49
	4	8	64
	4	8	64
Total	120		1062
Mean	12		

Table 12 (*b*)

$$\sigma = \sqrt{\frac{1062}{10}}$$
$$= 30.2$$

---

* Mean of the deviations (total deviations divided by the number of the data), i.e., $\frac{\Sigma x}{N}$, is called the *Mean Deviation*, *Mean Variation*, or the *Average Deviation*, and it is represented by the abbreviations M.D., M.V., or A.V. Though it is one of the accepted measures of variability it is little used in educational statistics.

What purpose the S. D. could serve? Out of the numerous ways of making use of the standard deviation, most of which are beyond the scope of this book, three are mentioned here.

Firstly, the S. D. could be used to find out whether the data in the group followed normal mode of distribution. This could be achieved with the aid of the Normal Probability Curve.

Two axioms have to be remembered at the outset. The frequency curved when it is drawn contains all the data in the group. In other words, the area enclosed by the curve represents the total number of data. And, since all variations in the individual data are measured against the mean, the M itself may be regarded as zero for measuring variations in the group.

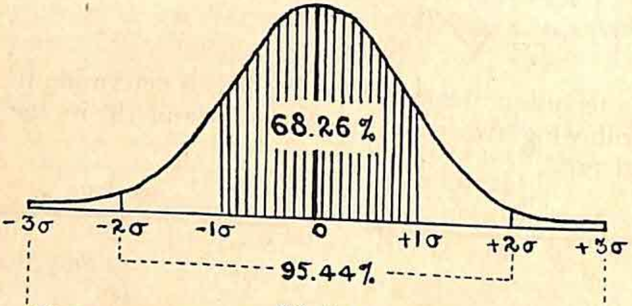

FIGURE 30
PROBABLE FREQUENCY OF THE SCORES IN A NORMAL CURVE WITHIN THE RANGE OF ±1σ, ±2σ, AND ±3σ.

Now if the total area covered by the NPC were regarded as 100, it has been estimated that the area covered by the distance $+1\sigma$ and -1σ (the shaded area in the Fig. 30) would contain 68.26% of the data. Let us see if this criterion is fulfilled in the data contained in the Tables 12 (a) and (b).*

The respective values of $M-1\sigma$ and $M-1\sigma$ in the first table are $12+3.3$ and $12-3.3$, or 15.3 and 8.7. Out of the 10 cases 6 fall within these limits; theoretically, there should have been 6.8 cases. For all practical purposes the data in the group may be regarded as following the normal mode of distribution. The respective values of $M+1\sigma$ and $M-1\sigma$ in the second group are 42.2 and -18.2 within the limits of which all the actual data can be accommodated. Therefore it could not be supposed that the data here are distributed as they ought to in normal cases; some sort of selection possibly has affected the group.

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* It should be made clear that in judging the normal frequency in a group the data must be numerically large. It is only for purposes of illustration that the data in the above tables have been used here.

It has been said above that about 68.26% of the total cases in a normal curve are expected to lie within the range of $+1\sigma$ -1σ. Likewise, if the ordinates were erected at a distance of 2σ above and 2σ below the mean, approximately 95% of cases in a normal curve would be expected to fall within this distance, and between $M+3\sigma$ and $M-3\sigma$ would lie about 99.7% of the data.*

Thirdly, the S. D. could be used for giving a more precise idea regarding the dispersion of the data in the group. Judging the two cases in the Table 13 it may not be difficult to tell in which of the groups the data lay more widely scattered. But the values of S. D. when used for comparative purposes may prove deceptive in the absence of certain other criteria. Suppose the S. D.s of two series of data were 10 and 5 respectively and their means 150 and 50. Superficially, the first group may appear to be more widely scattered than the second. But the *coefficient of variation,* which requires the use of S. D., may subsequently prove otherwise. The coefficient of variation or

$$V=\frac{100\sigma}{M}$$

The V in the two cases last mentioned

would be $\frac{100 \times 10}{150}=6.6$

and $\frac{100 \times 5}{50}=10.0$

Actually then it is the second group with the apparently smaller S. D. which shows greater variability in the data than the first.

In determining the S. D. when the data are tabulated according to the frequency distribution the formula to be employed is:

$\sigma=\sqrt{\frac{f\ x^2}{N}}$ where x stands for deviation of the mid-point of each interval from the mean of the total scores, f stands for the frequency in each step, and the rest of the symbols as before.

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* Since the number of the data could be increased to infinity the ends of the normal curve could never meet the base and it is only for practical advantage that the curve is cut off at $\pm 3\sigma$.

CORRELATION

Is it true that intelligent persons possessed broad foreheads? Would the pupils who were good in arithmetic prove to be equally good in geometry? Are emotional people kind-hearted by nature? Is proficiency in education invariably correlated with success in life? In answer to these and the innumerable other queries though we are often tempted to make sweeping generalizations we seldom give thought to the basic question: how to reach to the conclusion? The proverbial sparrow does not make summer, neither would two intelligent persons with broad foreheads decide the issue. It is true that usually the pupils who do well in one branch of mathematics tend to do well in other branches too, but there are exceptions to be reckoned with. Likewise, educational success is not always followed by success in later life. Qualitative analyses of such cases would hardly help us in reaching the final conclusion. There however is a way out to describe the interrelationship quantitatively.

Increase in the height with age till the end of the boyhood is a phenomenon which shows no exception. Some may grow less some more but all continue to grow. If an individual's record in age and height were kept till, say, the 12th year the relationship between his increasing height and growing years could be described with the symbol $+1$. That is to say, never could an instance be found when either of these measures had decreased or stopped. On the other hand the relationship between increasing age and chances of survival would be in the reverse ratio; if it were possible to find out when a man would die each day of his existence would decrease by the like amount the possibility of his further survival, increase in his age each day would take him nearer to death by that amount of time. Such a relationship could be described by -1. Now that we have the two maximum possibilities in the relationship, the foundation for a possible scale to describe mathematically the interrelationship is laid.

There are however many kinds of relationship which do not present such a certainty as depicted in these two illustrations. For instance, there are pupils who show equal proficiency in literature and science, but many others may not be put in this category. Now if the cases of both these types of students were examined together it would be almost impossible to analyse how far the proficiency in literature was related to the mathematical ability. Fortunately we have some statistical devices to help us. These are called *methods of correlation*, and the single numerical value indicating the relationship is called the *coefficient of correlation*. The coefficient of correlation may be any quantity between +1 and −1. The perfect positive correlation is obtained when the measures in both the series enjoyed the same status in increase or decrease within their respective groups. Out of ten boys if one secured the highest position in both the subjects tested, another stood second in both, and if this trend were maintained all through the list, the correlation between the two subjects could be described as perfect and positive. If on the other hand the measures followed diametrically opposite pattern, that is, one who stood first in the one got the last place in the other and *vice versa*, the result could be described as perfect negative correlation. If the correlation came to be zero it would mean that there was no certainty whether the increase in the one series of datum would result in the increase or decrease in the other series. Some of the principal methods of determining the coefficient of correlation are described below.

(*i*) *Product Moment Method:* To find the correlation between the series of scores X and Y in the first two columns (Tables 13a and 13b) the following steps have been observed.

Step 1. Mean of the scores in the series X was found from which the deviation of each of the scores was determined with due regards to the algebraic signs; these deviations were placed in the column x. Likewise the deviations of the scores in the column Y from the respective mean were determined and placed in the column y.

Step. 2. Product of each set of the x and y values was found and placed in the column xy; these were later summed and noted at the bottom.

Step 3. Each x value was squared and put in the column x^2; similarly the y^2s were put in the adjacent column. Standard deviations of X and Y were next determined.

Step 4. The following formulae were applied:

$\mathrm{r}=\frac{\Sigma\, xy}{\mathrm{N}\sigma x\sigma y}$ or, $\mathrm{r}=\frac{\Sigma\, xy}{\sqrt{\Sigma\, x^2 \Sigma\, y^2}}$ where r stands for coefficient of correlation between the series X and Y, and rest of the symbols as explained before.

These are also known as Bravais-Pearson Product Moment methods. Both of these have been used separately in the computation of the coefficients below:

	X	Y	x	y	xy	x^2	y^2
	6	8	−3	−3	9	9	9
	12	12	3	1	3	9	1
	9	9	0	−2	0	0	4
	16	20	7	9	63	49	81
	5	7	−4	−4	16	16	16
	11	11	2	0	0	4	0
	10	14	1	3	3	1	9
	14	18	5	7	35	25	49
	4	6	−5	−5	25	25	25
	3	5	−6	−6	36	36	36
Total	90	110			190	174	230
Mean	9	11					

Table 13 (*a*)

	X	Y	x	y	xy	x^2	y^2
	10	11	0	0	0	0	0
	9	14	−1	3	−3	1	9
	6	5	−4	−6	24	16	36
	12	9	2	−2	−4	4	4
	13	7	3	4	12	9	16
	16	14	6	3	18	36	9
	8	16	−2	5	−10	4	25
	7	15	−3	4	−12	9	16
	4	12	−6	1	− 6	36	1
	15	7	5	−4	−20	25	16
Total	100	110			−5	140	132
Mean	10	11					

Table 13 (*b*)

$$\sigma x = \sqrt{\frac{174}{10}} = 4.15$$

$$\sigma y = \sqrt{\frac{230}{10}} = 4.79$$

$$rxy = \frac{xy}{\mathrm{N}\sigma x\sigma y} = \frac{190}{10\times4.15\times4.79}$$

$$= \frac{190}{198.78} = .95$$

$$rxy = \frac{\Sigma xy}{\sqrt{\Sigma x^2.\Sigma y^2}}$$

$$= \frac{-5}{\sqrt{135.9}}$$

$$= -.003.$$

(*ii*) *Spearman's Rank Method:* By determining the deviations in the previous method account was taken not only of the position of the individual scores in the group but also of their size. The present method takes into consideration only of the position and so it is less precise.

Step 1. Rank the measures in the X series in the ascending or descending order, and place the ranks in the column R_1. For instance, the highest score in the series X (see Table 14) is 18, so it is given the rank of 1, the next highest score is 16 and it is ranked 2, and so on. Likewise rank the scores in the series Y and state the respective ranks in the column R_2. If there be two or more scores of the same value take the median of their ranks. In the present illustration there occur two scores of 11 in the Y series. Now, 15 has been given the rank of 3, and so both of the 11s should have been given the fourth rank. If however finer methods of scoring were available, possibly one of these 11s would have been more than exactly 11, or even less. Had it been so one of these would have been ranked 4 and the other 5. Since it is not possible here to make out for the correct position both are given the rank between 4 and 5, and the next score, viz., 8 has been ranked 6. The same principle is involved in ranking the 9s in the X series.

Step. 2. Difference between the ranks is listed in the column d.

Step. 3. Square the differences and place these in the column d^2.

Step. 4. Apply the formula $\rho = 1 - \frac{6 \Sigma d^2}{N^3 - N}$

where ρ (*rho*, a Greek letter) stands for the coefficient of correlation and the rest as explained before.

X	Y	R_1	R_2	d	d^2
16	16	2	2	0	0
14	8	3	6	3	9
18	20	1	1	0	0
9	5	6.5	7	0.5	0.25
10	11	5	4.5	0.5	0.25
12	11	4	4.5	0.5	0.25
6	3	8	8	0	0
9	15	6.5	3.0	3.5	12.25
Total					22.00

Table 14

$$\rho = 1 - \frac{6 \Sigma d^2}{N^3 - N}$$
$$= 1 - \frac{6 \times 22}{512 - 8}$$
$$= 1 - \frac{132}{504} = .74$$

With scores less than 50 in number the Product Moment Method is less useful than the Rank Method. Whichever method is used, the coefficient of correlation is a handy tool in describing the relationship between two sets of measures. The result obtained in the Table 13a, for instance, tells us that it is almost certain that the pupil who fared well in one of the tests would do equally well in the other. In other words, the requisite mental functions in both of these tests are more or less the same. The results of the Table 13b have something different to say. The coefficient here is practically zero, i.e., there hardly is noticeable any definite trend in the two series of scores. Had the result been high and negative it might have been interpreted that two rather opposite mental functions were involved in these tests. The result in the Table 14 may be interpreted in the same manner. Obviously there are many cases in the last illustration where one who has shown efficiency in the X type of work has achieved equally good result in the other; nevertheless there are *some* who have failed to maintain this standard and have done differently in the two tests. That is why the correlation is positive but not perfect or even near perfect.

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